

MOTOR AGE

Volume XXXVI
Number 3

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CHICAGO, JULY 17, 1919

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We show on this page one of the high grade cars which is equipped with the Waltham Automobile Clock, and the names of the others are listed below.

The manufacturers of these automobiles selected the Waltham because its accuracy, reliability under all road and climatic conditions, and its beautiful finish made it a worthy accessory for their cars.

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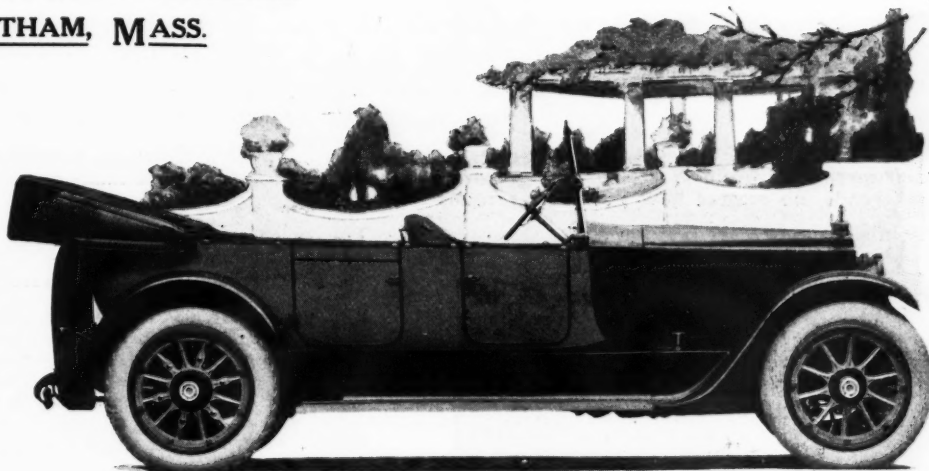
Waltham Model L

List of Cars Carrying Waltham Clocks as Standard Equipment

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Apperson	Haynes	Owen-Magnetic
Brewster	Hollier	Packard
Cadillac	Hudson Super-Six	Pierce-Arrow
Cole	Jordan	Rauch & Lang
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Dorris	Marmon	Winton

WALTHAM WATCH COMPANY

WALTHAM, MASS.

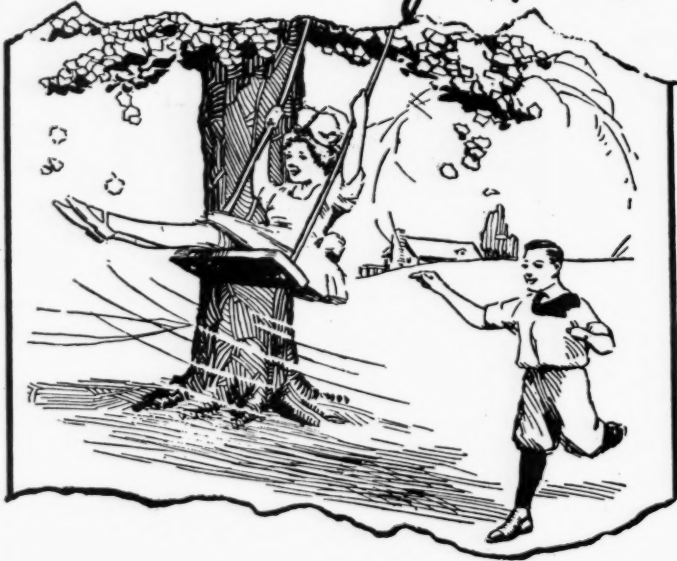


Packard 3-35 7 Passenger Touring Car Equipped with Waltham Automobile Clock

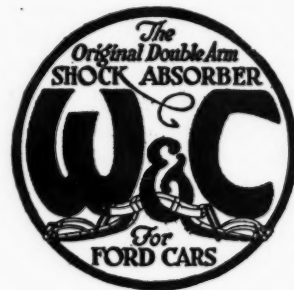
WALTHAM

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*Do you remember
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Everything
When You Have Said**



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**Still the Biggest
Seller at
\$10 per set of 4**

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CHICAGO, ILL.

MOTOR AGE

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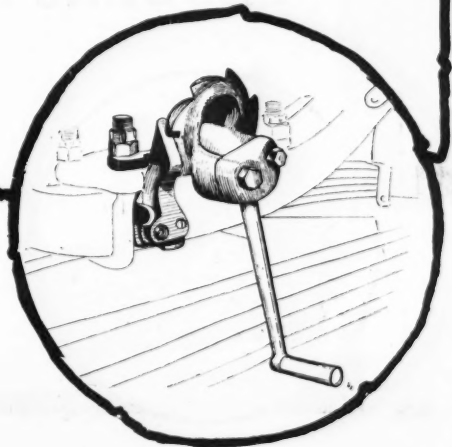
Atlasta is substantial and durable—a life-time wrist insurance.

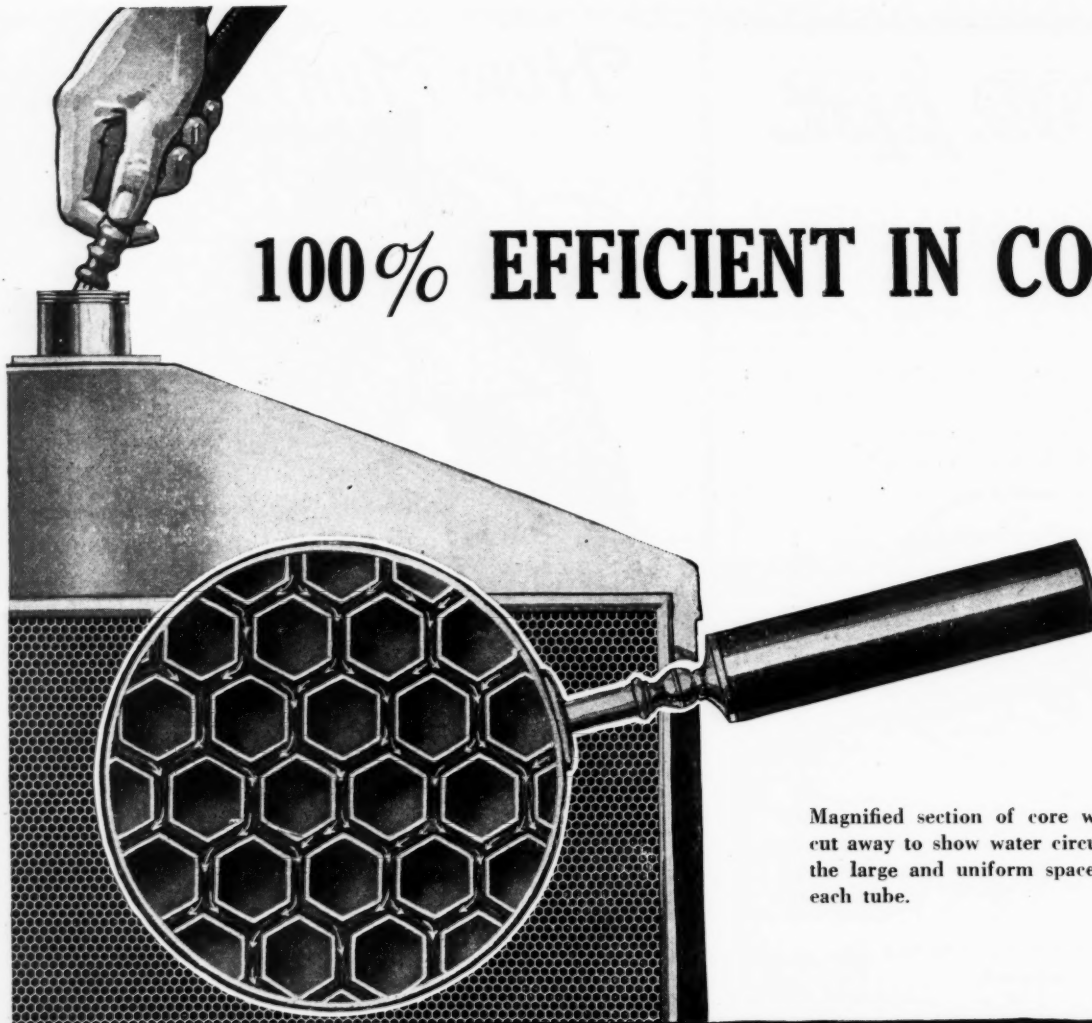
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We prefer to sell through our dealers. But in cases where dealers cannot supply, we will send the Atlasta by mail prepaid for \$2.50.

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Water spaces and air tubes are absolutely uniform in size and shape, minimizing all tendency toward clogging.

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This radiator is fully covered by patents, and we will vigorously defend our rights against its unauthorized manufacture, sale or use.

FEDDERS

GENUINE HONEYCOMB RADIATORS

Aeroplane Type

REPAIR PARTS STOCK A SERVICE NECESSITY

In stocking a supply of repair parts, a dealer is usually confronted with the problem of how large a stock should be carried.

The lead article in this number, while pointing out the necessity for carrying a repair parts stock for service, shows how the size of stock can be governed by sales. It goes without saying that accurate records are absolutely essential for sound purchases and that transportation is a big factor to be considered in maintaining the parts stock.

Every dealer should be interested in this article as well as the one which follows next week showing how to plan the stockroom and its equipment.

Did you read the lead article in last week's number showing how to master service problems with a master service sheet? If you didn't, better go to it right now; and then turn to the concluding article in this number which consists mostly of the forms used in connection with the master service sheet.

"The truth, the whole truth," etc.

Our good friend, Bill Strong, has something to say this week about telling the truth to the owner about his car and advises us against snap judgments on the need of complete overhauls, etc. Let's see what Bill has to say before passing judgment. Maybe he's right and maybe not. What say you?

WICHITA

While you are reading this, we'll be giving the tractor demonstration at Wichita the "once-over" and we hope to have something of real interest to tell our tractor and prospective tractor friends next week. Watch for our story.



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MOTOR AGE

Repair Parts Stock a Service Necessity

Size Controlled by Sales—Accurate Records Essential for Sound
Purchases—Transportation Is Big Factor

Next Week—Planning the Stockroom and Its Equipment

PRESENT motor car service conditions demand an efficient stockroom. The number of cars afield have increased enormously in the last few years. This fact has necessitated stocking large numbers of repair parts. In fact, the repair parts business has become the most important division of the distributor's service station. Distributors with many dealers in their territory frequently carry stocks in excess of \$100,000. This represents the major portion of a distributor's financial investment and must be efficiently managed to be prosperous. In such institutions carrying stock as large as this, the parts manager has become just as important a person as the sales manager. In fact, the entire personnel of the stockroom should be second to none. Its organization and method of business should be such that it could fill 95 per cent of the orders received without recourse to the source of supply.

Service Requires Organization

Organization is essential for good repair parts service. The service a repair parts station can give is dependent almost entirely upon the personnel and the division of work in the organization as a whole.

It is preferable to divide a stockroom organization into several divisions, each one having its particular field. Thus, a typical stockroom organization would consist of the parts manager, who is the centralized source of control for the entire organization, assisted by purchasing,

By Harlan C. Skinner

Motor Age Editorial Staff

stock record, orders, shipping and return goods department.

Co-operation with the factory is essential. The factory is the distributor's source of supply. Every effort should be made in the routine of business with the factory to follow their suggestions and thus lessen waste of energy at the source of supply. The factory should not be asked to make continuous C. O. D. ship-

1—The service parts stock is the determining factor in service.

2—Size of stock is controlled by parts sales and number of cars served.

3—Parts purchases to be based on sales records of last six months.

4—Suitable stock records necessary to prevent accumulation of inactive parts.

5—Anticipate the parts demand and use the cheapest means of transportation.

ments to dealers, when one should have the parts in the stockroom. Most factories prefer to handle large orders instead of frequent, small shipments. It is an economical proposition for both parties.

Various methods are in vogue for controlling the stock of a distributor. Some specify the amount of parts in dollars and cents a distributor or dealer should carry in proportion to the number of cars in their territory. These values per car

for different prices of cars are about as follows:

Under \$1,000	\$ 8-\$10
\$1,000-\$1,500	\$10-\$15
\$1,500-\$2,000	\$20-\$25
\$2,000-\$2,500	\$30-\$35
Over \$2,500	\$40-\$50

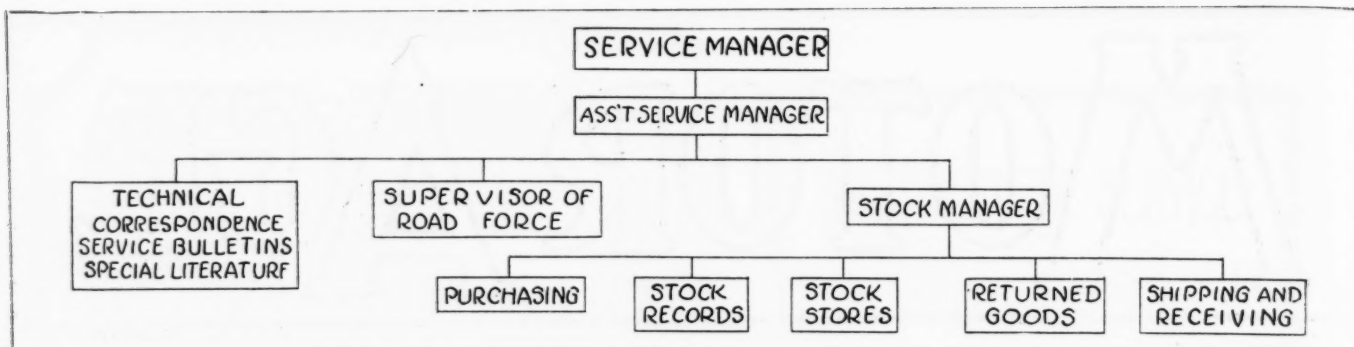
Others specify exactly the active parts that should be carried.

Each plan has its drawbacks. Under the former, the distributor may stock the required amount in dollars and cents but not the parts for which there is the most demand. The latter plan is designed to obviate this fault. It is also unsatisfactory because it does not consider that different parts of the country require different classes of repair parts. Examples of this plan have proved unreliable.

Classed by Conditions

While a certain list of repair parts may be satisfactory for the central states, a portion of this same list of parts would be classed as inactive in the mountain states. A forced plan of this nature simply loads up some distributors with a lot of repair parts for which they have no use, while in other cases it may be entirely satisfactory. If a forced plan is to be used, then why not divide the United States into certain zones in which the trouble with parts is in common? It is pure folly to attempt to generalize the parts demand over so large an area and with so many changing conditions.

There is no argument but what some limits should be placed upon the dis-



Typical service organization, showing departmental control with assistant service manager as clearing house

tributer's stock. There should be some definite form of check upon the service being given. If a factory decides to place some control over a parts stock in its service contract, then it should know the order-filling efficiency of its own stockroom and base its distributor's requirements upon its own performance.

Service Dependent on Stock

A distributor cannot give better parts service than the factory gives the distributor. If the order-filling efficiency of a factory is 92 per cent, then it cannot expect its distributor to give any better parts service. This method of requiring a distributor to fill a certain percentage of the orders received is a sure way of carrying a complete stock of parts for a certain territory. A weekly report on sales and back orders is a sure check over any service stock.

In putting this policy into effect some factories make a practice of auditing distributors' stocks at least once every two months. This prevents accumulation of obsolete parts and also simplifies the return of defective material, as the auditor can pass on such goods at that time and avoid the expense of having to ship them to the factory. Others require their distributors to forward an inventory of their stocks once each month. This aids the factory in controlling its own stock by the demand the distributor's stock is subjected to.

In connection with such a method as this it might be possible to work out a system of automatically replacing the distributor's stock in accordance with the demand and have such active material constantly flowing from the source of supply. In other words, the stock would change in cycles and be replaced by the factory, in accordance with the demand; thus always maintaining a sufficient stock, to give excellent parts service.

Demand Determines Stock

Determining the maximum and minimum number of parts to be carried by a stockroom is an important phase of stockroom management. Every parts manager should study the demand upon his stockroom and base his orders upon the factory accordingly. These values are proportional to the financial investment the stockroom represents. The stock should be made up of active parts, that is, the parts for which there is the greatest demand. The financial return from a stockroom is proportional to the

number of times it can turn its stock within a fixed limit.

The minimum and maximum numbers of active parts to be carried in stock should be watched carefully. As the number of cars in the field increases the minimum numbers of parts to be carried should be raised in accordance with the experience of the past six months and in proportion to the number of cars then in the field.

Most factories specify in dollars and cents the amount of parts a distributor should carry for each car in the field. This value varies with the price of the car and also with the ratio of the cost of a car by the parts list prices to the retail price of the car. Experience shows that this value will vary from \$8 to \$40, depending upon the two factors just mentioned. However, there is no fixed rule one can follow for determining the amount of stock to be carried, as it depends considerably upon the terrain of the country the distributor serves and his proximity to the factory. Theoretically, the amount of stock that a distributor should carry should increase as his distance from the factory increases.

Purchase by Demand

Good judgment is a thing the parts manager most needs. There are two classes of demand upon a stockroom, the actual and the fictitious. It is upon the actual demand that orders must be based. The fictitious demand is misleading. Just because a customer comes in and asked for a part that is seldom sold, do not make the mistake of ordering four or six of these from the factory. Examine the sales records for the last six months and determine the number that have been sold. If only one of these parts have been sold, then the logical number to order from the factory is two. After delivering the one part to the customer there will be one in the stockroom, which would be the proper number to carry under the circumstances. All parts should be ordered by these means, that is, the number should be based upon actual experience as shown by the sales of the last six months.

Purchasing parts from a factory on the strength of a fictitious demand causes the factory to make the same kind of purchases. It in turn may load up itself with a lot of parts for which there is no demand, and then in the course of time the concerns ordering parts in this manner will attempt to return them to the

factory for credit. A factory cannot be the dumping ground for the error of its representatives afield. It therefore should suggest business systems for these business concerns to follow that it may itself be protected.

Obsolete Parts Represent Loss

Usually parts lie around for a long time in a poorly managed stockroom before it is discovered they are not moving. Then an attempt is made to return them to the factory. Sometimes the factory has made the parts obsolete and they are a dead loss to the distributor simply because business methods were not used in the stockroom. In any event the distributor is going to suffer loss, as the transportation must be paid in both directions, and in all probabilities the factory will make a charge for handling these parts which are no longer active.

A factory is justified in placing a time limit upon the length of time a distributor may carry parts and still be able to return them for credit. Such an action is really a good thing for both. A factory cannot afford to carry the burden of mismanagement of its business representatives. However, every factory should encourage and suggest business methods for its representatives to follow.

The absence of proper stock records has been the greatest drawback to service. It has produced many makeshifts to cover the error in management. It has been a source of great expense due to the ordering of parts from a factory without a sound reason for doing it. It has produced fictitious purchases on the strength of a fictitious demand.

Accurate Records Essential

In carrying out these ideas to obtain the most benefits from the stock on hand it is absolutely essential that stock records be kept up to date. If the stock records are kept up to date and the minimum number of parts, which have been previously determined, closely followed and the orders kept flowing in so the stock will not run down, there will be little difficulty in keeping the proper number of parts in stock at all times. To maintain a loose set of records and never know what is in the stockroom is a sure way to ruin. Stock records are kept for a purpose. That purpose is to keep the stock up so that at all times the maximum of service can be given and also to make available the cheapest means of transportation from the source of supply to the point of distribution.

The average factory gives the distributor service on the parts it has in stock. The distributor also should give his dealer 24-hr. service on the parts he has in stock. To accomplish this result it is absolutely necessary that some simple system be used in the handling of orders and the checking out of parts from the stockroom. All orders should flow through the stockroom progressively. The general routing of orders to the stockroom should be such that there would be no duplicate travel and the order would travel straight through from the start to the finish without having to reverse its direction at any time. This not only saves time but it also saves confusion in filling an order. In this respect dealers should be educated properly to execute orders before they are mailed for fulfillment. A distributor should educate his dealers to typewrite all orders and have them complete in their specification. These orders should all be written on a standard form supplied by the distributor, preventing any necessity of re-interpreting the order upon its receipt at the distributor's stock room. Much time and money can be saved in checking and interpreting orders if they are made out properly at their source. It is up to the distributor to see that the dealer complies with instructions similar to this.

Abuse of the Telegram

Continual telegraph orders for active parts is admission of poor management. It is an uneconomical means of ordering parts, as it usually requires that parts be shipped by the most expensive means of transportation, namely, express. Most factories are flooded with telegraphic and telephone orders, in fact from 15 to 30 per cent of the orders received in a day will be by either of these two means. While a telegram or telephone call does reach the factory sooner, it does not expedite the shipment of the parts from the factory. In fact, a telegram loses some time right at the start, as it has to be interpreted and the order written and checked. It then flows through the factory system in the regular manner.

Factories invariably use good judgment in the way they handle telegraphic orders. If the telegraphic order is for a frame or some other part of similar nature which ordinarily would not be carried in stock, it is given every attention. However, if the order is for active parts which the party ordering should have in stock, then it is given the same attention as mail or other orders after it has been transferred from telegraphic form to a regular factory shipping order. The truth of the matter is that an order which is typed by the distributor and sent in special delivery will get almost as fast service as a telegraphic order. The reason for this is that the order already is written, the parts numbers are specified and the specifications complete, hence the factory does not have to do any interpretation except to check the order and price it as it passes through the regular routine prescribed for such orders.

If a stockroom is managed properly

and its records are kept up to date, the transportation expense will be reduced to a minimum. Continual telegraph orders requiring express shipments are expensive. It increases the overhead on the stockroom considerably and thus cuts down the possible margin of profit. A real live stockroom will have its active parts flowing in continually by freight, which is ordinarily the cheapest means of transportation. Factories have a great deal of trouble with express shipments and continually are bringing it to the attention of their dealers that they should follow closely some system of handling the parts in their stockroom and thus know what to order, how many and when.

Use Cheapest Transportation

Many distributors are taking advantage of the lost space in new car shipments and are having their parts sent through by freight in this manner. It has been found that carload shipments are handled much faster than single shipments.

The percentage of express shipments from factories will vary from 30 to 70 per cent. Factories that lay stress upon their distributors' having some form of perpetual inventory system for keeping track of their stock have the smallest percentage of express shipments.

Due to the volume of express shipments occasioned by frequent telegraph and telephone orders some factories have found it necessary to divide the United States into certain zones, in which they

FRENCH MONOPOLY ON GAS

Paris, June 28—The French government is to secure a monopoly for the purchase and importation of refined oils and gasoline. It is estimated that this monopoly will result in an income to the state of \$7,000,000 per annum. Details of the scheme have not yet been issued.

At the beginning of the war the French oil importers were under a contract to supply determined quantities of kerosene and gasoline to the army and to the civilians. These contracts not having been fulfilled, the government stepped in and adopted a practical monopoly for the purchase abroad and the importation into France of kerosene and gasoline.

Briefly, the proposed scheme is a continuation of this plan under the control of a department of the Ministry of Finances. The refinery of oils in France and sale in France would be left to private enterprises with state participation in the profits. Ten of the most important gasoline refiners in France have formed a joint stock company with a capital of \$6,000,000.

EXHIBITERS FOR PARIS SHOW

Paris, June 28—A list has been published of firms which will exhibit at the Paris show to be held in the Grand Palais next October. American firms figuring on this list are Buick, Cadillac, S. F. Bowser and Klaxon. Although the list is not by any means complete, it contains sufficient names of French firms to indicate that the show will pass all previous records.

make a specific charge in addition to the list price of the parts to cover the cost of transportation from the factory to the point of distribution. Experience shows there are about five zones in the United States. The transportation charge in these zones is taken care of by adding a certain percentage of the list price of the parts to the sale of these parts. This percentage varies from 5 to 25 per cent, depending upon the proximity of the zone to the source of supply. This percentage also will vary for each zone with cars of different price, and the ratio of the cost of parts at list price to the retail price of the car. This is an interesting parts distribution problem, as it is only fair that the distributors should have some means of covering themselves on the cost of transportation of parts from the factory to their own localities, particularly those who are located in the far western districts.

Standard Crates Economical

Crating and shipping of parts is an expensive factor in stockroom management. It is possible, however, by studying the weights and sizes of average shipments to reduce this expense. Standardized crates and boxes can be devised for certain articles like fenders, radiators, cylinder blocks, etc. It is also possible to work out boxes for shipments of certain weight. These standardized crates and boxes can be purchased in large quantities, thus avoiding the expense involved in building each box or crate individually. This is a subject that is well worth the study of any stockroom manager. Development in this field must be done for each car, as the variation in sizes of parts for different makes of cars prohibits the use of standardized boxes for many makes.

Defective parts returned to the factory for credit should be handled in some standard form and shipped to the factory at regular intervals. All parts should be cleaned thoroughly before they are returned to the factory. The reason for this is obvious, as they must pass through some form of an inspection at the factory end. To realize the most from returned parts, it is absolutely essential that the parts be properly tagged, giving all the specifications of the car from which it was removed and also a full history of the part and why it failed. If the system recommended by the factory is followed out closely in all its details, considerable difficulty will be eliminated in the handling of defective parts returned for credit.

Psychology of Appearance

Appearance is an important factor in stockroom management. A stockroom manager should always bear in mind he is selling goods to the public the same as a department store. The sales section and every other section of the stockroom should be kept orderly and clean. Customers like to do business with a house that has a progressive appearance. The stock sales clerks should be neat in appearance. Remember the scope of a repair parts business can be increased only by business methods.

Purchase Paves Way for New Ford Era

Concentration of Stock in Hands of Three Holders Points
to Production of Car Complete from Raw Materials
to Finished Product as Formerly Proposed

DETROIT, July 11—Edsel B. Ford, president of the Ford Motor Co., today purchased all the minority stock in the Ford Motor Co. except 2,180 shares held by Mayor James Couzens. The sale involves approximately \$75,000,000 and makes Henry Ford, Edsel Ford and James Couzens sole owners of the company. It is the largest and most important transaction ever recorded in Detroit's financial history.

Details of the sale were made public by Frank L. Klingensmith, vice-president of the Ford company. Edsel Ford, previous to the sale, held 300 shares of Ford stock. He now owns 6420 shares. There were 8300 shares held by outside interests. Henry Ford owned 11,000 shares. Approximately \$13,000 a share was paid the minority stockholders for their holdings.

Minority Stockholders

The number of shares held by the minority stockholders and the approximate price paid each one is as follows:

Horace H. Rackham, 1000 shares, \$12,500,000.
John Dodge, 1000 shares, \$12,500,000.
John Anderson, 1000 shares, \$12,500,000.
David Grey, 525 shares, \$6,562,500.
Paul Grey, 525 shares, \$6,562,500.
Phillip Grey, 525 shares, \$6,562,500.
Alice Kales, 525 shares, \$6,562,500.
Mrs. A. P. Hauss, 20 shares, \$250,000.

Added to the price paid for the stock it is estimated that close to \$17,000,000 will go to the Government in excess profit taxes. The deal was financed through Stuart W. Webb of Bond & Goodwin and F. M. Holmes of the Old Colony Trust Co., of Boston. Henry Ford, though owning the controlling interest in the company, took no part in the negotiations. The acquiring of the minority interest stock is for the purpose of reorganizing the Ford Motor Co., although there is to be no change in any way in the personnel of the officers or department heads.

Through the reorganization plan it is the ultimate desire to make the new company a co-operative one, that is, the employees of the firm technically would succeed the minority stockholders of the old Ford company as stockholders in the new corporation. This part of the scheme is made known by Henry Ford, who says:

"By making it a co-operative company we propose to make it possible in the future to divide the melons that have in the past been cut with the minority stockholders, with our workers."

Concentration of control of the company was precipitated by the desire of the Fords to be free to conduct the affairs of the company without the interference of minority stockholders. The recent suit of John F. and Horace E. Dodge to compel a distribution of profits which Mr. Ford had intended to use for

THE project of Henry Ford to form a new company to manufacture a cheaper car to sell at less than \$250 ends with the acquisition of virtually all the minority stock of the Ford Motor Co. While wintering in Los Angeles Mr. Ford last March astonished the world when he announced a plan to place such a car on the market. Edsel B. Ford states, however, that the designing of the new car will be continued and if his father and himself decide to put it in production it will be manufactured from the present Ford plant and placed on sale as a new Ford model.

"Of course there will be no need of a new company now," said Edsel Ford. "We will develop our plans for the new car in the Highland Park plant which we now control. We will try to be ready to manufacture it just as soon as we catch up with orders on the present standard models. We are overflowing with orders for standard cars, however. We are making about 3200 daily and orders are coming in for more than 4000 daily. Plans for the next fiscal year, beginning Aug. 1, call for greatly increased production. It is probable that some of our other plants which are now used for assembling, will be equipped to do some of the manufacturing."

plant expansion is evidence that he was not left free to direct the policies of the company without the interference of the minority of the stockholders. Last February after a lengthy lawsuit the Michigan supreme court ordered Henry Ford to pay stockholders \$19,275,385 in dividends which had been held back as accumulated surplus for expansion purposes. As the result of this ruling Mr. Ford found it practically impossible for him to carry out the vast improvements

WILLIAM C. DURANT, president of the General Motors Corp., had an opportunity to buy control of the Ford Motor Co. in 1908 for \$6,000,000 but Wall Street would not finance the purchase. Today J. P. Morgan & Co. are forming a syndicate to advance \$75,000,000 to finance the purchase of the minority stock of the company.

Henry Ford and James Couzens were at the Belmont Hotel in New York in the summer of 1908. Mr. Durant went to see Mr. Couzens to ask him if Mr. Ford and he would sell their interest in the Ford company. Mr. Couzens conferred with Mr. Ford on the matter. Mr. Ford was ill at the time and felt that he needed a rest from business cares. He also felt that he had more money than he would need. The result was that Mr. Ford and Mr. Couzens told Mr. Durant they would sell for \$6,000,000.

The country had not recovered from the financial crisis of 1907 and Mr. Couzens tied a string to the offer. He specified that payment be made in gold. Mr. Durant set out to raise the money. He failed. Wall Street said he was too ambitious.

which he planned on the River Rouge, where his blast furnaces and shipbuilding plants are located. Here he had intended to center an industry with feed branches all over the United States and extending into foreign lands.

The history of the Ford Motor Co. is one of the greatest romances of modern business. The company has grown in sixteen years from a little machine shop with a working capital of \$28,000, into an organization with assets of more than \$250,000,000. The men who backed Henry Ford in his early ventures in the internal combustion vehicle field were, with two exceptions, poor men who risked everything they had on the belief that some day the motor car would supplant the horses and that Henry Ford had solved the secret of the accomplishment.

Stock Then and Now

Wall street laughed at Henry Ford when he went to New York for financial aid. To raise funds to finance the company he placed the stock on the public market and together with Alex Y. Malcomson made a barnstorming trip through the states in an effort to sell the stock. The stock was not easily sold, however. Every man of sixteen years ago had the same opportunity to be a stockholder in the Ford company on the same basis as the retiring stockholders had. The stock for which John W. Anderson and Horace H. Rackman paid \$5,000 each now brings \$12,500,000, exclusive of the untold millions in dividends which it has paid.

To Alex Y. Malcomson, coal miner and shipper, must go a large measure of the credit for the organization of the Ford Motor Co. He assumed the role of financial angel for the struggling concern. He was a fairly wealthy man, and it was his money that put the company in a way to turn out its first models. It was through Malcomson, a legal client of Horace Rackham, that Mr. Rackham, Mr. Anderson and several others of the original company were induced to invest their money. Anderson and Rackham were law partners.

James Couzens, then cashier in the Malcomson coal office, caught the spirit of the venture to a much greater degree than did the other investors. He became so enthusiastic over the gas engine Henry Ford had developed that he resigned his job in the coal office to put the Ford Motor Co. office in order and establish a sales organization.

The present company was organized in June 16, 1903, with an authorized capital stock of \$150,000, divided into 1500 shares. Of this amount \$100,000 was subscribed for, \$49,000 in cash and notes and the remaining \$51,000 representing the value of letters patents issued and

applied for to the value of \$40,000; \$10,000 in machinery and \$1,000 in contract supplies.

This stock was divided as follows: Henry Ford, 255 shares; Alex Y. Malcomson, 255; John S. Grey, 106; John F. Dodge, Horace E. Dodge, James Couzens, John W. Anderson, Horace H. Rackham, Albert Strelow, Vernon C. Fry, Charles H. Bennett, each 50 shares; and Charles J. Woodall, 10 shares. Par value of each share was \$100.

Contract with Dodge

It was Feb. 24, 1903, that the Dodge brothers were brought into the organization, taking a contract to supply the Ford company with chassis at \$250 each. Six hundred and fifty were contracted for that year. This called for \$162,500 and was the first large contract ever entered into by the company. The understanding was that failure of the Ford company to pay for this material would result in the cars being turned back to Dodge brothers. In addition they were given 100 shares of stock and advanced \$10,000 to get production started. The Dodge brothers, however, were forced to turn their entire plant over to Ford production and borrow \$40,000 to carry out the contract.

Strelow obtained his stock through assuming a contract to build the first Ford company building on Mack avenue. He put up a wooden structure of one story. Bennett, Fry and Woodall were friends of Malcomson's. Woodall was a clerk in his office and Fry a member of the same church. It was through Malcomson that John S. Grey was interested in the company. He put \$10,000 into the concern.

The first Ford car was sold in July, 1903. It was a two-cylinder, opposed-type engine, a light runabout. Production on a quantity basis was then entered into, 650 cars being assembled and sold that summer, an unheard of record in production in the motor car industry as it then existed.

Henry Ford was president, general superintendent, engineer and designer for the new company, and James Couzens was treasurer, office and sales manager. The plant was a one-story building on Mack avenue, 60 by 200 ft. The office force consisted of one stenographer. Forty men were employed at the start.

All parts were contracted for with outside machine shops, Dodge brothers furnishing the chassis. The plant was on an assembling basis only, all parts being made on standard specifications. The runabout sold for \$750 and the larger car with the tonneau, for \$850. Cost of production was figured at \$250 for the chassis; body, \$52; wheels, \$26; tires, \$46; assembly, \$20; and selling and advertising, \$150. On the selling price net profit was figured at \$196 for the runabout and \$246 on the tonneau model.

Selden Patent Troubles

The company was on the high road to success when in August, 1904, notice was served on it that it would have to go out of business because it was manufacturing without the Selden patent li-

cense. Things looked dark for the Ford company then, for the Selden organization was at that time one of the most powerful of its kind in the country. The stockholders, however, decided to fight it out in the courts and voted \$40,000 for the job.

The United States district court ruled against Ford but on the appeal to the court of appeals in New York, the Ford company won after a long-drawn-out litigation. In the meantime several of the original stockholders had withdrawn from the organization. Mr. Ford paid Mr. Malcomson \$175,000 for the stock to gain control of the issue. Several of Malcomson's friends also sold out at the same time, and it was in this reorganization that the present Ford stockholders obtained their holdings.

By these purchases Henry Ford increased his controlling interest to 58½ per cent, where it stood up to the time of the purchase of the present stock.

The Ford company, in its last published annual statement as of July 31, 1918, had total assets of \$203,749,460, which included \$37,117,363 in real estate; \$29,335,982 machinery and equipment; \$44,522,562 material in process of manufacture; \$91,471,851 cash and accounts receivable; \$67,981 patent rights; \$1,231,906 inventories and \$1,815 investments. Against this was checked liabilities of \$2,000,000 capital stock; \$10,653,327 accounts payable; \$5,950,564 accrued expenses; \$9,902,841 depreciation reserve and \$175,242,728 surplus.

The Ford Motor Co. has twenty-eight branch factories in the United States, three branch factories and seven branch houses in Canada, representing a total of 212 acres of floor space. Sales agencies are located in all the principal cities of the world. Approximately 3,200,000 Ford cars have been produced since organization of the company. Production is now 3200 cars daily.

Production Notes

Willys-Overland is producing 200 cars daily, approximately 40 per cent of the production reached just previous to the strike eight weeks ago. Nearly 8000 men are back at work in the Toledo plant, where 12,500 were laboring the day the strike was called. Vice-president C. A. Earl states the backbone of the strike has been broken. There has been no trouble to speak of since the company opened up again under the protection of the United States district court.

Mr. Earl states also that the price of all Overland models will be advanced within the next ten days. The coming week also will see the new Overland model 4 on the market. This car is now in production. The price will be announced shortly. The company planned to manufacture 180,000 cars this year but, owing to the strike, production probably will not exceed 150,000.

In June the Barley Motor Car Co., Kalamazoo, manufactured 127 cars, its largest month's output.

Production of engines at the plant of the General Motors Corp. at Saginaw, Mich., is now at the rate of fifty daily. Within thirty days this production will

run up to 200 engines and from then on the schedule will continue to be boosted until a production of 300 engines daily will have been obtained. These engines are of the four-cylinder type and are for light trucks and cars. The Central Products Co. which has been formed there with a capital stock of \$10,000 is in reality another General Motors enterprise. Those interested in it are H. L. Barton, T. S. Merrill and H. E. Rice, all G. M. C. officials. The company will make parts for G. M. C. cars and trucks.

Actual work has started on laying out the new Wills-Lee factory just south of Port Huron, Mich. Surveyors have started work surveying the site and will complete the layout plan for the new model city to be built here.

RANIER MODELS IMPROVED

New York, July 11—The Ranier Motor Corp. has added several improvements to its line. All models now have Continental engines and Brown-Lipe clutch and transmission. The ¾-ton is fitted with 35 by 4½ pneumatic tires and has a heavier Timken worm-driven rear axle. Bosch electric lighting equipment is furnished as an extra at \$125. Body prices remain unchanged but with the improvements the following chassis prices go into effect:

¾-ton	.....\$1,750
1-ton	.....1,875
1½-ton	.....1,975
2-ton	.....2,400

LOCOMOBILE \$1,400 HIGHER

Bridgeport, Conn., July 11—Locomobile has made a greater price jump than any, advancing \$1,100 on open cars and \$1,400 on closed models with still greater increase on special body jobs, necessary, as explained by the company, to maintain and develop production up to customary standard under present costs. The new schedule of Locomobile prices brings the touring car from \$7,000 to \$8,100, the special four-passenger touring from \$7,100 to \$8,200, the limousine and landaulet from \$8,200 to \$9,600, the chassis alone jumping from \$6,000 to \$7,100, and custom-built bodies as high as \$11,000.

AUTOCAR TO COST MORE

Ardmore, Pa., July 11—New Autocar prices effective Aug. 1, are announced by the Autocar Co. The chassis of the Autocar truck will be \$2,300 for the 97-in. wheelbase and \$2,400 for the 120-in. wheelbase. Orders placed before Aug. 1 will be accepted at the present price of \$2,050 for the 97-in chassis and \$2,150 for the 120-in. wheelbase chassis.

TO REPEAT GOOD ROADS TOUR

Minneapolis, Minn., July 12—The McGarry-Walker tour will start from here July 25. This is the annual run during which the \$1,200 Good Roads trophy offered by the Automobile Club of Minneapolis is awarded to the county which shows the greatest amount of improvement on the roads selected for the tour between the time of the pathfinder's trip, which this year began June 14, and the tour proper. Dodge county won the trophy last year.



EDITORIAL



How the Wind Blows

THE announcement by the International Harvester Co. of a cut of \$225 in the price of the Titan tractor, following so closely the cut of \$135 in the list price of the Fordson is not necessarily a straw which shows the way the tractor price wind may blow. Upon the contrary, the logic of the situation will not warrant the conclusion that tractor prices generally will be reduced.

THESE two concerns happen to be the largest producers of tractors in the country. Both have large manufacturing facilities and can produce cheaper than many others of the tractor makers. Both have at command efficient sales organizations which permit a saving in overhead selling expense. Considerations which might lead to price reductions for either or both of these concerns may not be, and probably are not applicable to the tractor trade as a whole. The chances are, on the other hand, that price reductions are impossible for most, at least, of the others.

IN THE case of the International Harvester Co. the admission is made frankly that the reduction is for the purpose of stimulating demand and is not based at all upon changes in the cost of either materials or labor. Probably the same implication lies in the case of Henry Ford & Son. It may even be that some few other tractor manufacturers may follow suit, for exactly the same reasons, but there is no present warrant for the belief that tractor prices in general will be reduced materially in the future.

INDEED, the probabilities point rather to a stable level of tractor prices for some time to come, and even to an increase in some instances. Material costs, labor costs and the costs of all other factors entering into tractor production and distribution are high and will remain high. Thus it would appear that what one or two or three tractor manufacturers may do is no safe criterion by which to judge what the majority will do.

Price Changes and Dealer Discounts

WHEN prices on automotive equipment advance and dealer discounts remain unchanged, an undoubted advantage redounds to the dealer. The reverse of this condition introduces a reasonable doubt. This for the reason that the overhead of the dealer is likely to be the same in both cases, and while in the one he can make a wider margin of profit, in the other his margin is narrowed.

MANUFACTURERS often act upon the supposition that price reduction stimulates trade and thus the dealer profits by an increased volume of business. It happens, however, that supposition does not always predicate results correctly. For this reason we wonder where the tractor dealer will get off who must sell tractors after the price has been reduced at the same discount he received before.

OVERHEAD selling cost, service cost and amount of service all are independent of the price the farmer pays—they likely will be constant factors in the dealer's equation,

leaving the final result in net profit dependent upon the selling price. Change the latter one way or the other and profit rises or falls in proportion.

PRICE reductions have occurred in the tractor business which were accompanied by an increase in the dealer discount so that the dealer made as much or more profit at the new price as he did at the old. A notable instance occurred recently in the case of a tractor which is handled exclusively through automotive channels. Still more recently a price reduction has been made on a tractor which is almost exclusively in implement hands, which leaves the dealer discount the same on the new price it was on the old. Manifestly this leaves the dealer holding the bag with nothing but increased sales to rely upon to fill it. At the best tractor discounts are too low. To reduce their results, measured in terms of profit, still lower by price reductions hardly looks like justice to the dealer. The contrast afforded by these two instances is suggestive.

Controlling Parts Purchases

THE stockroom should base its purchases upon the monthly average of the last six months. This is much more accurate than for a shorter time of three months, as there are times during the year when business is very heavy and not a real criterion. This is especially true of the early fall months. One is liable to overstock in assuming that these short estimate periods are a true indication of the average demand.

MOST parts managers desire to keep a three or four months' stock of parts on hand. Thus from the monthly average of the last six months they will determine the number of parts to be ordered. This controls the stock very accurately and keeps it moving. The financial return is propor-

tional to the number of times the stock can be turned. Hence it is important not to have money tied up in inactive parts.

A PARTS stock that is several thousand miles from its source of supply should be larger than one only a few hundred miles distant. This is necessary on account of the time required for transportation and to be able to meet any extraordinary demand that might be made upon it. This can be controlled by purchasing one or two months' more supplies than would the stockroom nearer the source of supply. In other words, the danger limits on the parts would be higher to cover the transportation time element, which is one of the factors governing the size of the stock.

Motor Camp to French Government to Dispose of U. S. Reconstruction Park to Best Advantage

To Take All Material Not Needed by Army

PARIS, June 20—Verneuil, the biggest reconstruction park of the Motor Transport Corps in France, was closed this week and is now in the hands of the French military authorities. This park was constructed to care for the reconstruction and salvage of all automotive material and of a considerable amount of quartermaster material for the A. E. F. It was in active operation rather less than a year. Under the present arrangement, the French government will take over this park and will dispose of it to the best advantage. It is not known whether the machinery will be pulled out of the buildings and sold separately or whether the entire installation will be disposed of as it stands.

Verneuil is just one item in the big program the French are now handling on war material. In principle, it is understood that the French government will take possession of all the American material not required by the army. This comprises all the cars, trailers, bicycles, motorcycles and other rolling stock. The Motor Transport Corps has prepared a complete inventory of its material, together with its estimated price of each machine. This has been submitted to the French government, who has appointed a group of technical officers to verify the list and the prices. Up to the present the material has been found satisfactory and the prices very reasonable. It is impossible, however, for the American authorities to sell anything in France, and the French are naturally unable to put any vehicles on the market until they have completed their arrangement with the Americans.

Junk Only Burned

The situation in France is very incompletely understood, with the result that all kinds of wild stories have been circulated in the press. It has been claimed notably that the Americans are so dissatisfied at the delay that they have set fire to cars and trucks rather than take them back to America. This is absolutely incorrect. All the motor transport and aviation parks have received instructions to clean up as far as possible, and in many cases, where material was not worth salvaging, they have set fire to it. Many truck and ambulance bodies which have been through the war are now in an absolutely wrecked condition and are nothing more than junk. The wood is not worth salvaging; to dismount the bodies to get the metal would cost more than the work is worth. On this account, these bodies were burned, and the remaining metal collected and sold as scrap. The French papers have constructed this as a case of burning good material.

Another case is that of motorcycles and sidecars. The army was entitled to sell these as scrap metal but not as motorcycles. After a certain number had been sold it was found that the purchasers had been able to recover from them a few complete frames and had put these on the market as frames, thus putting the American Army in the position of having sold complete vehicles without permission from the French. To prevent a repetition of this the officer in charge of the camp gave orders that all the scrap motorcycles and sidecars should be smashed with a Holt caterpillar tractor before being sold to anybody as scrap metal.

The claim also has been made in the French press that societies such as the Y. M. C. A., K. of C., Red Cross, etc., have been selling their vehicles privately to dealers, who, in turn, have re-sold them at excessive profits. It appears that only one of these associations has sold its vehicles, but even in this case they did not remain in France, but were at once sent abroad.

FRENCH AGENT FOR PACKARD

Maurice Bayard-Clement, one of the well-known French manufacturers, has taken up the exclusive selling agency in France for the Packard and will open showrooms in the Avenue des Champs-Élysées. He is in America at the present time. From inquiries made at the Bayard-Clement factory it was learned that although he is associated with his father in the manufacture of cars, this agency does not in any way concern the company. Bayard-Clement, Sr., long has been a lover of Packards and for several years always has had at least two in regular service for long-distance touring. J. Greene, the Packard service agent in France, states that he has received no official notification of the agency in France having been granted to Bayard-Clement.

Previous to the war Packard maintained its own service and sales department in Paris. During the war the agency has been handled by Gaston Williams & Wigmore.

PIKE TOUR NOW ON

Detroit, July 11—The annual East Michigan Pike tour started with nearly fifty cars on the trip which ends at Sault Ste. Marie Saturday. The tour is being conducted by the Detroit Automobile Club and in the past has been a vital factor in promoting better highways along the Huron coast. As Michigan has voted to spend \$50,000,000 to complete the trunk highway system of the state, this probably will be the last tour of its kind as all the roads of eastern Michigan are included in prospective road building work.

Lieut. Arthur H. Klein, driving his Peugeot racer, set the pace at the start. William Mitchell, Bay City, official tour pathfinder, was to relieve Klein at Pontiac and pace the way to Sault Ste. Marie. The tourists will visit Pontiac, Port Huron, Saginaw, Bay City, Alpena, Cheboygan, Mackinaw City, St. Ignace, Roscommon, Gaylord and Grayling.

French Tractor Trials

Semi-competitive Tests Will Be Held in Devastated Area This Fall

Machines Must Fill Requirements to Enter

PARIS, June 28—Having realized that tractor demonstrations of a non-competitive nature are useless to both the farmer and the manufacturer, the French Society of Tractor Manufacturers announces that its next competition to be held from Sept. 29-Oct. 5 will be of a semi-competitive nature. This event is looked for the neighborhood of Senlis, Oise, this district having been chosen because it is in the devastated area, where there is greatest need of tractors and modern agricultural implements.

The competition is of an international nature, foreign machines being received on the same footing as those of French construction. Entries will open Aug. 1 and close Aug. 14. No manufacturer can enter more than two machines of any one type, or six in all in the three classes specified under the rules. These classes are: Tractors hauling a usual type of plow; self-contained machines, and special machines for small cultivation, such as vineyard, vegetable gardens.

Tests to Be Held

During the first three days of the competition elimination tests will be held, and any machine unable to fulfill the minimum conditions laid down will be called upon to withdraw from the demonstration. These preliminary tests are four in number as follows:

- 1—Plowing 478 sq. yd. per horsepower to an average depth of more than 10 in.
- 2—Plowing 598 sq. yd. per horsepower to an average depth of 8.6 in.
- 3—Plowing 837 sq. yd. per horsepower to an average depth of 7 in.
- 4—Plowing 1794 sq. yd. per horsepower to an average depth of 3.1 in.

Owing to the absence of a recognized type of recording dynamometer giving the actual drawbar pull and owing to the inexistence of a standardized type of plow, there will be no real competition with awards in the order of merit. Instead, an official report will be prepared on the work done by all machines which have passed these four preliminary tests. This official report will state the actual amount of ground cultivated, the quantity of fuel consumed and will give the dimensions of the engine and weight of the tractor.

A special class is prepared for experimental machines not yet in production. These machines are received free of any entry fee and will work without any official control, the only condition being that they shall remain on the ground during the whole of the demonstration.

The agricultural tractor commission of the Royal Automobile Club of Belgium is interesting itself in a competition for tractors which can be operated by one man in the field.

France Open to All Foreign Cars

Touring Models That Are Imported Will Pay 70 Per Cent ad Valorem Duty

PARIS, June 28—It is now clear that all kinds of cars can be imported into France. Touring cars will pay a 70 per cent ad valorem duty. Trucks weighing not less than 511 lb. pay the same duties as before the war plus an ad valorem tax of 20 or 10 per cent. As American trucks come in under the preferential tariff they will have to pay 50 francs per 100 kilos plus 10 per cent on their value.

The decree issued a few days ago was so obscure that it has been very difficult to obtain an exact understanding of the situation. There appears to be no doubt now that the above interpretation is correct. The official explanation of the adoption of a temporary ad valorem tax on practically all goods is that the French duties before the war were mostly based on weight. As the value of all material has considerably increased during the last five years, these duties have become insufficient. For instance, goods which in 1914 were worth \$4 a kilo in many cases are now worth \$10, and it is to cover this difference that the ad valorem tax has been established.

It is difficult to understand why touring cars have been picked out for special treatment; they are not on the list of prohibited articles, nor do they figure on the list of articles which can be brought in at the old rates, plus the new ad valorem taxes. It is because of this that confusion has arisen: some persons arguing that as they were not prohibitive they were free to be imported on the pre-war basis, whilst others believed that the temporary 70 per cent duty instituted during the war still remained in force. It has now been declared that this latter interpretation is the correct one.

While a 70 per cent duty in normal times would be absolutely prohibitive, the demand for cars now is so great that some will be sold despite this duty if quick delivery can be made. It is evident that as soon as the French factories get into production, which is expected to be toward the end of the year, it will be impossible to sell foreign cars in France on a 70 per cent import duty. The general impression is, however, that the duty will be reduced when the home factories are in a position to meet local requirements. At the present time new French cars are being sold by dealers at an increase of 15 to 30 per cent on the makers' catalog price. Cars are so rare that clients can be found willing to pay this extra price.

HERRING TO SELL PLANES

Des Moines, Iowa, July 11—C. L. Herring, head of the Herring Motor Co., is to enter the airplane sales field. Last week Mr. Herring entered a new firm which will handle Curtiss planes in this territory. The company is unnamed. It will control territory from Des Moines west in Iowa and in eastern Nebraska. A

branch office will be opened in Omaha. In active charge will be Lieut. Clarence Young, recently discharged from the Air Service. Twelve planes have been purchased by the new company, and one sale has been made. While Mr. Herring is financially interested in the new concern it will be entirely independent of, and not a department of, the Herring Motor Co.

MOTORS HERE AND IN FRANCE

Washington, July 11—A total of 122,128 cars, ambulances, trucks, motorcycles, bicycles and trailers were reported to form the motor transport strength of the United States army in the United States, and 124,139 of these vehicles form the motor transport strength of the army in France, according to statements made by Brig. Gen. C. B. Drake to the Commit-

tee on Military affairs at the recent hearing. Of these numbers cars in the United States total 9592; in France, 9809; trucks in United States, 57,712; France, 51,781; and motorcycles in the United States, 16,712, and in France, 22,802. Following is the complete table:

	United States	France
Motor Cars	9,595	9,809
Ambulances	5,167	7,089
Trucks	57,712	51,781
Motorcycles	16,140	22,802
Bicycles	9,974	26,867
Trailers	23,543	5,791
	122,128	124,139

For an army of 500,000 men on a peace basis the War Department would require 4182 cars, 20,973 trucks, 10,170 motorcycles and 3591 trailers. The trucks would comprise $\frac{3}{4}$ -ton, $1\frac{1}{2}$ -ton and 3-ton to 5-ton sizes in addition to the four-wheel-drive types.

The Motor Transport Corps on a peace basis is expected to include 20,737 enlisted men and 1148 officers.

PIERCE-ARROW ALSO HIGHER

Buffalo, N. Y., July 12—Increases of \$1,250 have been made in the Pierce-Arrow. The seven-passenger 48-h.p. model now sells for \$7,750, as compared

FOREIGN NEWS IN BRIEF

NOT a single American army truck or touring car has been sold in France. Reports are circulating that thousands of American cars are rotting in France and that practically new Cadillacs can be bought for a few hundred dollars. This latter statement is absolutely false. There are two or three groups of keen French business men watching the American army cars very closely and ready to purchase the entire lot as soon as they are released. Personally I have met scores of men who have been told that somebody else had bought an army Cadillac, but I have not been able to find a single man who had made a purchase or who could give me the name of a man who had succeeded in getting possession of any American army car.

ALL the French car and aviation factories have been closed by an engineers' strike. When this dispute started in the general engineering trade, the car factories were not particularly concerned, and a certain number of the shops kept open despite the orders to come out. Among these were Delage, Anzani, Scap and Citroen. The strikers, however, broke into the shops and persuaded the men who were at work to throw down their tools.

THE fact that the French car factories are producing nothing for immediate delivery, together with the practically total prohibition of imports, has had its influence in boosting used car prices beyond all recognition. Almost invariably an early 1914 car can be sold from 50 to 100 per cent more than it cost when new. The French Y. M. C. A. is selling used Ford cars at \$1,600. A big batch of Fords having been through the war, and in only moderately good condition, are being sold at \$900 each to purchasers

taking quantities. The French government is selling new Fords at \$1,200, but there is no guarantee, and the purchaser must go to Bordeaux to take delivery.

As an ordinary example of car prices, a 1913 10-hp. four-seater Panhard which was bought in 1916 for \$2,400, was sold today for \$3,600. The car has never been painted since it left the factory, its engine has never been taken down, and one of the frame members has been broken and has had to be repaired by acetylene welding. This is not an exceptional case but is merely given as an example of the prices prevailing in France.

CITREON, who promised an output of 100 cars per day from the month of May, has fallen down on his program. All sorts of wild stories have been circulated as the alleged reason for this. At the present moment the entire works are closed, only the office staff and the engineers remaining at their posts. The Citroen company states it has been delayed by reason of difficulties in getting supplies and particularly by reason of the shortage of malleable castings. All these difficulties have been overcome, and the factory is so far ready to go into production that if the strike were to end now it would be possible to turn out fifty cars a day within a month and 100 a day within two months.

Immediately after the armistice Citroen announced a definite program and made definite promises of delivery, whereas other manufacturers had to admit that they did not know what they were going to do or when they would produce. The result was that there was a real scramble to place orders with Citroen. Now that he has failed to make deliveries on time, the people who were the first to get in their orders are generally the loudest in their denunciation or the most extravagant inventors of stories regarding Citroen's failure to produce according to schedule.

with \$6,500, while the seven-passenger 38-h.p. model is \$7,250 instead of \$6,000.

Changes have been made in the car at the same time. A new system of ignition and a new transmission are fitted. The ignition is a double battery system designed by Delco in collaboration with Pierce-Arrow engineers. The new system is as reliable as the magneto-battery and entirely overcomes the difficulty of synchronization, it is claimed. Pre-ignition from the magneto at high speed no longer is possible. Instead, two timers and distributors, working in unison, give sparks simultaneously at all speeds.

Safeguards to conserve the battery current have been devised. When the car is left in a locked position the battery automatically is disconnected from the engine and the headlamps are shut off. The small bulbs used at night can be turned on, however. They consume so little current, there is no danger of battery depletion. The new transmission was designed to facilitate gearshifting.

Other changes include elimination of dashlamps, raised instrument board with luminous dials, tire carriers on rear and upholstery to suit purchaser.

WILLYS LIGHT AND POWER PLANT

Toledo, Ohio, July 11—Manufacture of electric light and power systems for places remote from central power plants will be started immediately by the Electric Auto-Lite Corp. and allied plants. This was made known to-day by Walter L. Roberts, sales manager of the new division to be known as the Willys Light division.

The Electric Auto-Lite Corp., is the largest manufacturer of electric lighting and ignition systems for motor cars, and the expansion into the new field is but a short step. The manufacture of the electric lighting plants will be started immediately, and they will be on the market Aug. 15.

The lighting systems will be made in the various plants of the corporation which are adaptable to this line of work. The engine will be the Willys-Knight produced in the Elyria factories. The parts will be forwarded to Toledo factory No. 1 and assembled there. Production will be in such numbers that an adequate supply will be on hand when the product is placed on the market. The price of the lighting systems will be announced later, but it is expected it will be about \$525.

In addition to the 250 service stations of the corporation, branch sales office have been opened in Spokane, Denver, Minneapolis, St. Louis, Detroit, Syracuse, Philadelphia, Dallas and Atlanta.

STEVENS-DURYEA TO COME BACK

Chicago, July 14—The Stevens-Duryea Motor Car Co. has been reorganized and will resume manufacture of its cars. During the war the plant was used in the manufacture of munitions. The same workmen have been retained and the production of the car is expected to commence soon. The Magnetic Motors Corp. of this city will continue as Chicago representative of the Stevens-Duryea.

Farm Light Battery Rating Is Adopted

Makers Propose to Accept 72-Hour Intermittent Elapsed Time Test

CHICAGO, July 11—The question of rating farm light batteries, a problem which has received much thought since the inception of the farm light, was decided yesterday at a meeting of the Isolated Electric Plant Manufacturers section of the National Gas Engine Association. The rating adopted is the 72-hr. intermittent elapsed time test as was proposed at the meeting of the S. A. E. at Ottawa Beach and which is now in the final stages of being accepted.

Farm light manufacturers long have been undecided as to the rating of their batteries. This hesitancy has not been caused by lack of the proper knowledge concerning the proper rating of the battery but has rather been caused by the lack of organization amongst the producers. Now that the organization has been brought about, the adoption of a standard is made possible.

Some of the manufacturers were reluctant to adopt this intermittent rating, stating that the rating did not fairly represent the batteries' capacity, that the 8-hr. test was more reliable, older and better understood, etc. However, the adoption of one standard by all would give a reasonable basis for making com-

parisons and hence the reason for the adoption of the intermittent test.

In the event that the standard S. A. E. intermittent test, now completed and awaiting only to be distributed in pamphlet form to the manufacturers, should not be accepted by all manufacturers in general which seems hardly probable, provision was made for the adoption of any other standard the S. A. E. may propose.

During the meeting the question of the proper status and relation of the interested parts manufacturer to the Isolated Electric Plant Manufacturers section received considerable discussion. It was not thought advisable that the parts manufacturer should be given a voting right in the proceedings of the organization. It was argued to the contrary by the representative of the Prest-O-Lite Co., who stated that it would be hardly considerate to give a manufacturer of a very limited number of plants the power to vote when other concerns such as his devoted considerable time and spent large sums of money in the development of a battery for the whole farm light industry.

As finally proposed by R. H. Grant, sales manager of the Domestic Engineering Co., Dayton, Ohio, chairman of the reporting committee, the status of everyone with relation to the organization was to be as follows: Manufacturers of complete and partially complete plants were eligible to membership in the organization with a voting power. Parts manufacturers were also eligible to membership but were not to have the power of vote. Further action on this question will be taken at the next meeting.

Henry Kennedy, vice-president Lalley Light Corp., spoke on service to be given by the manufacturer, distributor and dealer. The ninety-day guarantee was urged in favor of the one year or blanket guarantee which in the past has been given.

BEGINNING BUSINESS IN 1915

St. Louis, Mo., July 12—The National Automobile Dealers' Association has taken up with the revenue commissioner the question of how much invested capital a motor car dealer may take as a war-profit credit in its return of income under paragraph 2, subsection C of section 311, War Revenue Act of 1918.

The question was brought up at the request of a Kansas City member, who began in business in 1915 and, therefore, has no pre-war average upon which to figure his profits. Harry G. Moock, business manager of the N. A. D. A., estimated that 50 per cent of the dealers of the country entered the field since 1914 or are interested in the case because of incompleting bookkeeping methods.

Sale of U. S. Motors to France Halts

WASHINGTON, July 11—The sale to the French government of trucks, cars and other automotive equipment belonging to the American Expeditionary Force in France, has been held up as a result of what is considered an inadequate offer, according to Director of Sales C. W. Hare. Mr. Hare declared that the French government has offered only \$300,000,000 for all American army equipment in France, including automotive commodities which it desired to purchase and which has an aggregate cost value of \$1,500,000,000. As a result the sales have been suspended and a small party of industrial experts under Mr. Hare will be sent to Europe to organize sales offices and organizations throughout the continent to dispose of the equipment, unless France makes a better offer.

"If France will not pay a fair figure," Mr. Hare added, "we will take the equipment out of the country and sell it elsewhere." Sales are planned to Belgium, Roumania and Poland. American aircraft in Europe will not be subject to his disposal, said Mr. Hare, but trucks, cars, motorcycles, tractors and practically all other army equipment will be either sold or, if necessary, returned to the United States.

There are 9,800 cars, 7000 ambulances, 52,000 trucks, 22,000 motorcycles and 5,700 trailers in France belonging to the American Expeditionary Forces.

The dealer wants to obtain for his business a different median classification from wholesale dry goods, butcher business or the like. Instructions have been issued by the commissioner that the company should take 10 per cent of its invested capital for the taxable year to figure out its amount of credit until a list of the medians can be arrived at. A board of review is now going over these medians, and a decision is likely within the next thirty days.

The association is advising its members who were in business in the pre-war period to furnish a statement of their profits at once to help to arrive at these medians. Refunds will be arranged, and credits allowed to be taken in successive payments if a sum greater than 10 per cent is allowed.

One dealer gave as his profits 37 per cent net for the pre-war period on his invested capital. Another dealer's pre-war net profit was 50 per cent. A company made an average of 97 per cent on both invested capital of \$10,000 and its borrowed capital of \$60,000. If it had done this in a pre-war period, the company would have lost credit for 87 per cent of its profits if the 10 per cent median is adhered to.

HUGE GOODYEAR PLANT ON COAST

Akron, Ohio, July 11—Ground will be broken this week for a \$26,000,000 rubber and cotton plant for Goodyear at Ascot Park, Cal. Deeds cover 550 acres. This plot will be developed with tire and cotton plants. Construction engineers are on their way from Akron to California, and the building of the large plant, which is to employ about 3500, is to be completed this year.

The first building will employ 3000 men and will turn out that number of tires each day. As soon as tire production is taken care of the company expects to erect the proposed cotton factory which will draw its raw material from the cotton fields of Imperial Valley and the Salt River in Arizona.

ANOTHER CAR-AIRPLANE DEALER

Milwaukee, Wis., July 14—The entry of motor car distributors and dealers into the aircraft field was accentuated during the week by the organization of the L. D. Flint Aeronautical Co. of Milwaukee, to manufacture, buy, sell and deal in aircraft, parts, etc. At the head of the new concern is Leslie D. Frint, president of the L. D. Frint Motor Car Co., distributor of the Oldsmobile in Wisconsin and Upper Michigan. Henry E. Griffin, manager of the Frint motor concern, and H. R. Overly appear as incorporators of the aircraft merchandising organization. The name of the line of aircraft which the company will feature will not be given out until later.

ORDERS, ORDERS EVERYWHERE!

Milwaukee, Wis., July 14—Fortunate indeed is the Milwaukee dealer who can make prompt delivery of a car these days. While there has been a shortage of cars for more than two months, the acuteness of the scarcity did not become so sharply apparent as during the last

week. For some reason or other, prospective purchasers got the idea that after July 1 dealers would be supplied with a liberal quantity of cars, judging from the rush which was experienced throughout the week. This probably was accentuated by the credence which had been given rumors circulated for many weeks that car prices would undergo a material reduction all along the line on July 1. The car supply showed no improvement. Nor did prices drop. But the clamor for cars continues.

Despite the limitations the acute shortage of cars imposes, Wisconsin motor registrations have broken all records and now stand at 210,000, an increase of 28,000 over the total registration of cars during all 1918. With favorable conditions relating to production between now and Dec. 31, it is believed the 1919 registration will reach 225,000.

DON LEE TO MAKE BODIES

Los Angeles, Cal., July 11—Don Lee, Cadillac distributor for California, has bought the entire plant of the Earl Automobile Works and will expand the business, already considered the largest west of Detroit, into one of the largest motor car body plants in the country. The new concern will be known as the Don Lee Coach & Body Works and will be operated entirely separate from the distributing agency. J. W. Earl, who started business here in 1889, will continue as active manager of the plant, and Harley Earl will be chief designer in the coach and body departments.

CURTISS BUILDING MORE PLANES

Buffalo, N. Y., July 12—The Curtiss Aeroplane & Motor Corp. is going to make strong efforts to sell airplanes in South America. Accompanied by several aviators with airplanes, C. W. Webster, supervisor of sales for South America, soon will depart for that continent on a trade trip. The aviators will give sales demonstrations.

The Churchill street plant of the company has begun work on two sales department contracts. The first is for 150 land machines of the Oriole three-passenger type. The second is for seventy-five seagulls of the flying boat type, carrying a pilot and two passengers. In addition, the local plant will build 200 engines of 150 h.p.

MORE TRUCKS FOR ROADS

Washington, July 14—Special telegram—The fourth allotment of trucks, 8771, has been turned over to the Bureau of Public Roads by the War Department and in turn has been allocated to the various states, making a total of 20,522 trucks that have been distributed to the various states for road construction and maintenance.

The last allotment includes nine types and many used trucks, including miscellaneous light deliveries, all used, GMC, $\frac{3}{4}$ -ton chassis, used and new, miscellaneous 2-ton trucks, used, Pierce-Arrow 2-ton trucks, used and new, light aviation trucks, used, miscellaneous 3-ton trucks, used, Pierce-Arrow 3-ton trucks, used and new, and heavy aviation types. Texas

received the most trucks, being allotted 500. New York, second with 427; Pennsylvania, 394; Illinois, 375; and Ohio, 318.

FRENCH LEAVES NATIONAL

Indianapolis, Ind., July 15—Lucius French, advertising manager of the National Motor Car & Vehicle Corp., has resigned to become secretary of the Western Oil Refining Co. of Indianapolis. Mr. French is one of the pioneer motor car advertising men of Indianapolis, having been the first advertising manager of the Cole Motor Car Co. ten years ago and for the last five years, holding the same position with National. During the war his services were utilized by the Government in the preparation of instruction matter for tanks, artillery tractors and army trucks. Entering an officers' training school at the Rock Island Arsenal during the first year of the war he was commissioned first lieutenant and was shortly promoted to the rank of captain. As an army officer, Captain French compiled and issued twenty-nine official instruction manuals on army motor equipment.

The Western Oil Refining Co. operates a chain of tank stations and filling stations throughout Indiana, Ohio and Kentucky, with general offices and factories at Indianapolis and Columbus, Ohio. The change is to become effective Aug. 1.

TAX RULING ON PARTS

Washington, July 14—The commissioner of internal revenue has advised the motor car trade that parts or accessories purchased prior to Feb. 25 are taxable when sold in connection with a truck or other motor vehicle, as provided in the revenue act of 1918. The tax does not apply to such articles purchased by the dealer from a manufacturer before the same date and sold on or after Feb. 25 separately.

WHITE AND JONES JOIN HOLT

Peoria, Ill., July 14—E. A. White has resigned head of the Division of Agricultural Engineering, University of Illinois, and Aug. 1 will become research engineer for the Holt Mfg. Co.

Fred W. Jones of the advertising department of the International Harvester Co. of America at Chicago has been appointed advertising manager of the Holt Mfg. Co., effective July 10.

E. J. MOON VICE-PRESIDENT

St. Louis, Mo., July 12—E. J. Moon, son of the founder of the Moon Motor Car Co., has been elected vice-president of the company. Mr. Moon returned from Army service in time to design the Victory model and as a reward for getting out the car he did, his election followed.

VAIL FOURTH IN RACE

New York, July 11—The rechecking of the tape Wednesday on the Sheepshead Bay race of last Saturday showed Ira Vail was fourth and O'Donnell fifth, reversing their order in the ranks of the winners.

National Demonstration Opens With Few New Tractors

General Regret that Rules for Event Are Not Such as Will Result in Valuable Data

By B. M. Ikert

Motor Age Editorial Staff

WICHITA, KAN., July 14—Special telegram—The largest farm tractor demonstration in point of numbers of manufacturers taking part got under way here to-day. But the demonstrations this year are, in the minds of most of the makers, not going to prove nearly so valuable as last year, because the rules are not so useful and when the demonstrations are over none of the makers will have any data that will be of material value. The tractors plow, and that is about all they do. Nobody knows how fast they plow, how much fuel they use, how many trouble stops they have or anything else.

Practically all the national tractor makers are here except the new Samson of General Motors, and it is a matter of general regret that it is not here. Fordson is here with one of the biggest exhibits, and there are hundreds of Fordsons around Wichita, just as there were around Salina a year ago. Plowing starts tomorrow, and while it is impossible to place any estimate on what the attendance will be, there is a pessimism because the demonstrations are being held two weeks earlier than last year. This is added to by the fact that harvesting is later than usual. Very little threshing of winter wheat has as yet been done through Kansas. The farmers are badly behind. The wet weather has held them back. Many will remain at home for threshing rather than attend the demonstrations.

Nelson Making Debut

There are not many new tractors here, but the few are more or less radical. The four-wheel-drive Nelson from Boston is making its debut at the demonstration. It is very unusual and a four-wheel-driver and has not patterned after existing types. Front and rear wheels are driven by a special type of chain, one driving the front wheels and another the rears. A Wisconsin four-cylinder engine drives through a compact two-speed gearset which in turn drives a double sprocket over which passes the two driving chains, which are not the conventional types but with alternate links lying at 90 deg. to each other so the sprockets instead of having conventional-shaped teeth have recesses to receive the chain links.

The tractor is without a frame, the engine and gearbox being supported between two vertical side plates of armor which serve as a frame form and enclosure for the parts. The wheels are unusual, with skeleton rims in which

slanting brace pieces do duty of lugs. Front and rear wheels are the same diameter, 54 in. Ball bearings are used in the gearset and axles. The tractor is in three sizes, a 15-24 for three plows listing at \$1,765; a 20-28 for four or five plows at \$2,800, and a 35-50 for six or eight plows at \$4,000. The tractors are being built by the Nelson Blower & Furnace Co., an old firm with a well fitted factory. Production is promised at four per day by Aug. 1.

Another new tractor is the Wolverine, a Saginaw, Mich., product, which is a combination wheel and creeper type. In front are two guiding wheels and at the rear in the center is the creeper with a balancing wheel at each side of it. Normally these balancing wheels do not rest on the ground but do so when the creeper sinks into the earth. These wheels are of small diameter and have wide tires. They are keyed to the shaft that drives the creeper and so rotate at approximately the same speed as the creeper travels at. It has capacity for four plows and lists at \$3,200.

California tractors are better represented than at any previous demonstration. The Best, one of the pioneer creepers, is here, as is the Bean Spray, a creeper type with a single creeper in front and provision for attaching the implement directly to it so the operator sits on the implement and controls the tractor through extension controls. The Bean Spray is a very unusual design and is shown in two models. The smaller model uses a V-type, two-cylinder engine mounted at one side of the creeper and with the radiator at the opposite side. It is an exceedingly compact job and is intended for orchard work, being very low and narrow. It can be used for cultivator attachments.

The Pan from St. Cloud, Minn., is shown for the first time. It is a trim-looking job built on Fordson lines and is a good design. Some improvements are noted on existing types that have been on the market for several years. The Wallis Cub, Jr., which has always been a three-wheel job, is shown also as a four-wheel design. It has been known for nearly two years that the J. I. Case Plow Works has had four-wheeled types under test, but this marks the placing of it before the public. The three-wheel job has scarcely been altered in attaching a front axle, which is supported by a plate at-

tached to the front end of the trough-like crankcase which has been a feature of the Wallis. The front wheels are small in diameter with very wide rims.

The Cletrac is shown with its new creeper tread which has been in production for a month. It is lighter than former treads and has self-cleaning features. The Cletrac is also fitted with a new combination water and centrifugal air washer, which is a compact box-like design placed outside of the hood.

There is a larger display of motor cultivators than ever seen at a demonstration, which suggests the broadening of the tractor field and the development of particular types for special fields of work. The motor cultivator has always been looked to as a big factor, and this year shows it coming into its own. The J. I. Case Plow Works has a two-row type of conventional design using a four-cylinder Wisconsin engine which drives through a gearset to a jackshaft and thence by exposed pinion and gear onto the rear wheels. It is a triangular design with a single wheel in front.

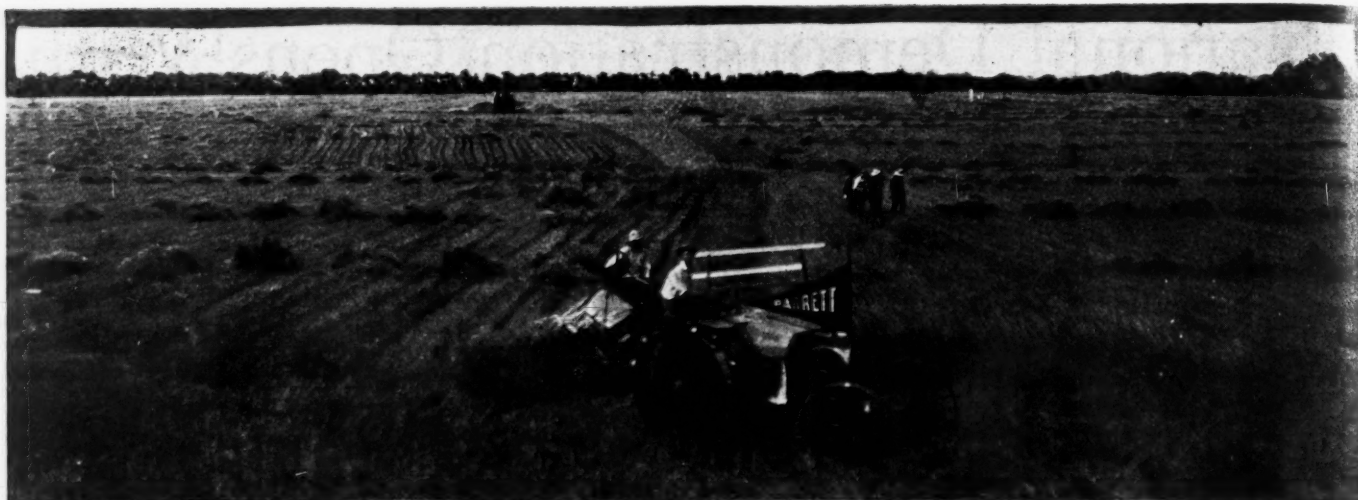
A new cultivator is the Wilson, a recent development of the Wilson Tractor Co., Peoria. It is a clear-vision type in that the four-cylinder Le Roi engine is mounted transversely to the right side of the center line so the operator has a clear view ahead of him. In other respects the job is conventional.

Farm Machinery

The influence of the tractor on the design of farm machinery is more apparent to-day than a year ago or even at the annual show in Kansas City last February. One of the latest examples is that of the International Harvester Co., which has a tractor binder in which the machinery of the binder is driven from the tractor instead of being driven from the bull wheel of the binder. The binder cannot be used except with the small I. H. C. 8-16 tractor. There has been added to the tractor the necessary gearing and control levers to take the power off for driving the binder. Only fifty jobs have been built, and these have been widely distributed for experimental purposes. Good reports are coming in from the job.

Incidentally this is the first western demonstration in which the I. H. C. 8-16 tractor has been shown. It took part in eastern demonstrations last fall, but was kept out of the Central West. This tractor uses a vertical four-cylinder engine and is a two-plow type. The combination of tractor and binder lists at

(Concluded on page 31)



The 127-acre wheat field the Parrett tractor harvested, threshed and plowed

Parrett Test on 127-Acre Field

Demonstrating Officially Ability of Tractor to Harvest,
Thresh and Plow for Next Crop—Started June 26

WICHITA, Kan., July 14—Special telegram—To demonstrate officially the capacity of a tractor in the wheat belt in harvesting, threshing and plowing the ground for another crop the Parrett tractor was started June 26 in a 127-acre field of winter wheat to harvest it, thresh it and plow the field. Harvesting and threshing have been completed, and the plowing is nearly completed. When finished, it will mark the end of one of the most comprehensive tractor tests of an official character that has taken place.

What Reports Cover

The official character was added by having it conducted by officials and observers from the Kansas State Agricultural College, Manhattan, Kan. Prof. F. F. Frazier of civil engineering is in charge, and he has three students who have acted as observers, so every minute since the start on June 26 of the tractors their work has been under official scrutiny, and carefully prepared reports have been made covering kerosene and oil required as well as water needed in radiator and also in the air washer.

The official report also shows the time exact number of stops, the length of each in minutes and seconds and the cause of each. In a word it is a most complete report and one that will furnish what the tractor industry so badly needs, namely, some official figures on performance in various lines of farm work. It is fortunate that some makers have undertaken official tests of this character as such tests furnish the only official figures on performance that will come from Wichita this week.

The national tractor demonstrations held here are entirely wanting in records. The rules take no recognition of fuel consumption, speed of plowing in the tests, stops, etc. The tractors sim-

By David Beecroft

Directing Editor Class Journal Co.

ply start plowing, and when they get through they stop and the public is none the wiser as to the exact performance of each. The Parrett test has been on what is known as the Royal farm 9 miles out of Wichita, and the test has been on a fairly level field of 127 acres of winter wheat. The wheat was cut with an 8-ft. binder which required 52 hr. 54 min. of actual working time. The binder was so coupled with the tractor as to permit of one man operating both by extension tractor controls that permitted the operator to ride on the binder. The Parrett company developed this one-man system some months ago, and in the test it worked entirely satisfactorily. While one man can do the work successfully, it is a man's job. Kansas wheat this year has heavy straw which did not stand up as well as generally, and the binder task was specially exacting.

The total harvesting time, including stops due to tractor and binder, was 71 hr. 59 min. The kerosene used was 111 gal. per acre, or 2.68 gal. per hour. The rate of harvesting was 1.76 acres per hour. No attempt was made to run the tractor night and day continuously as the test was not an engine non-stop or a tractor non-stop test, but similar to that any farmer would give. The harvesting was carried on until midnight and sometimes later, until the wheat grew too damp to cut and work was put off until 8 or 9 in the morning.

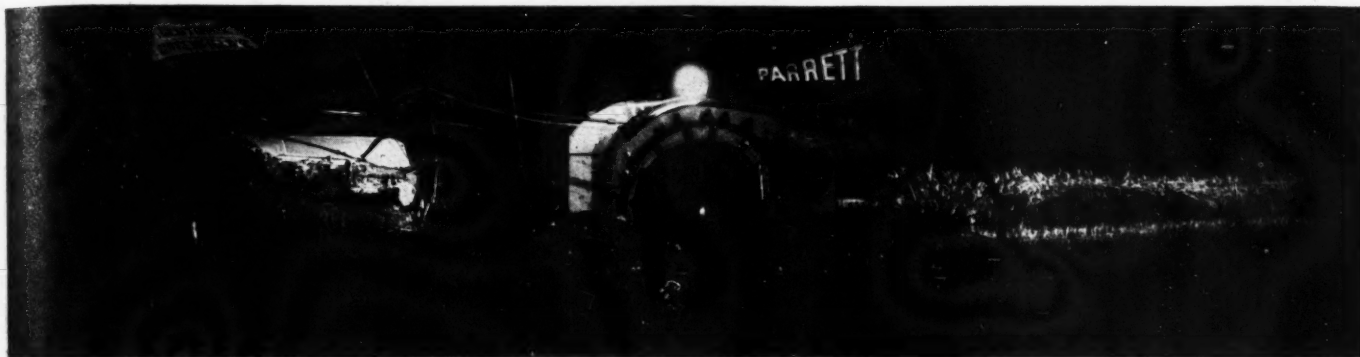
Threshing the wheat proved as good a tractor test as cutting and of equal importance, as nearly 50 per cent of the tractor's work is belt work such as threshing. The threshing job was almost entirely a tractor one, as two extra Parretts were used to draw the wheat

to the 23-in. threshing machine which the tractor under test operated. The threshing test was not continuous, as rain interfered and a delay of three days was caused by such, when the tractor was stopped as the farmer would have to do. The gross threshing time practically equalled the harvesting or cutting time and was 72 hr. 10 min., but the net threshing time was 61 hr. 12 min. The difference between gross and net was due to stops by tractor or threshing machine. Threshing was done at the rate of 2.1 acres per hour. The kerosene used was 1.89 gal. per hour or approximately .9 gal. per hour more than needed for harvesting. Water added to the radiators amounted to 47 gal. and to the air washer 13 gal.

Stops While Threshing

Total tractor stops for threshing were 1 hr. 21 min., largely due to carbureter adjustments, repairing fan belt and attention to air washer. There was one carbureter adjustment of 13 min. and another of 7 min. Most of the troubles with the tractor occurred at night, especially those of the fan belt, which also happened in plowing. The plowing of the 127 acres is not yet completed, but is more than half done. In this part of the test the tractor is operating 24 hr. a day with four shifts of operators and four shifts of observers. The tractor is pulling three 14-in. Oliver plows, working 6½ to 7 in. deep and averaging slightly over 1 acre per hour.

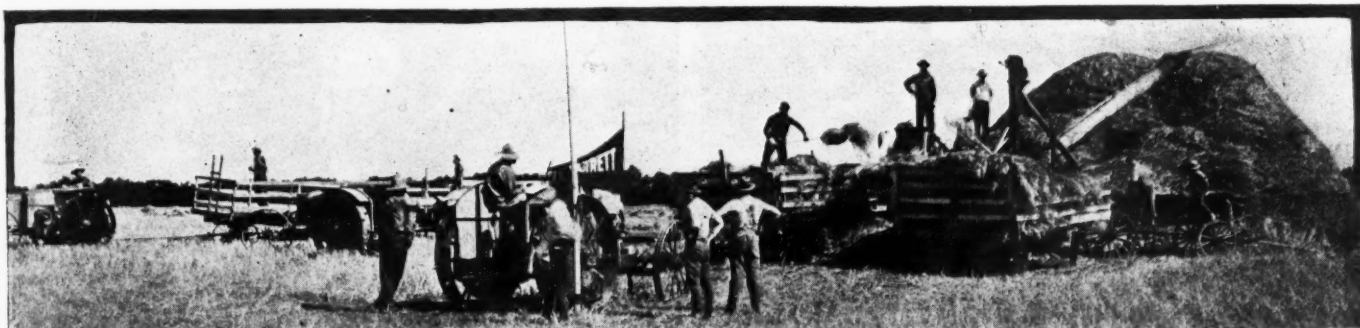
Thus far there have been few plowing stops due to the tractor. One night the fan belt lacing broke, which resulted in damaging the return water hose to the radiator and the delay totaled 1 hr. 40 min. Another night the gearshifter fingers in the gear-set stuck and there was a delay of over an hour. There have



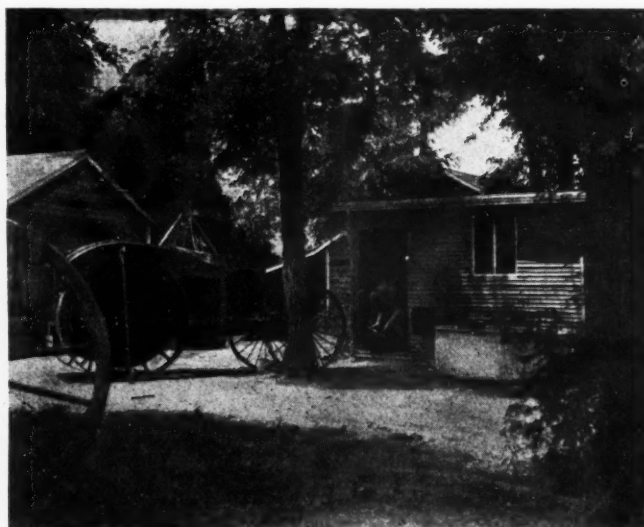
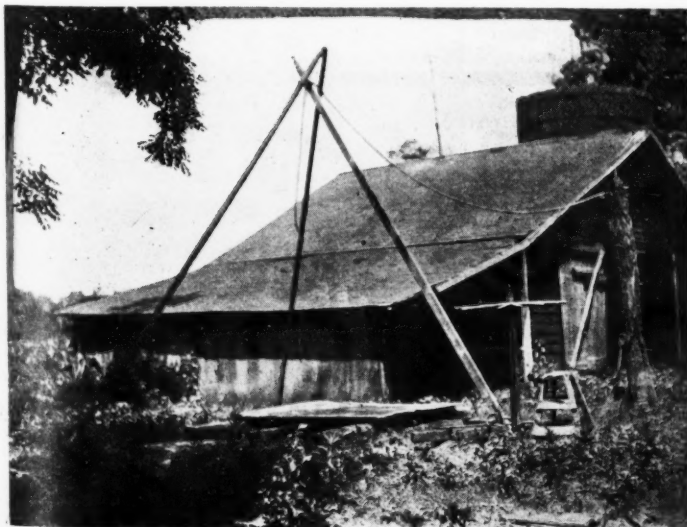
Night harvesting with the Parrett, which worked until midnight and 1 a. m. and then laid off until 9 a. m., due to the wheat being too damp to cut. The tractor engine was stopped in the meantime



Two tractors were needed to draw the wheat to the threshing machine. Each pulled two trailers. There were two additional trailers, so two were at the threshing machine always



The Parrett after harvesting 127 acres of wheat threshed it with a 24-in. thresher



Temporary house fitted with spray baths for test, left, and tractor pumping water for baths and other uses



Delivering the loaded trailers at the threshing machine, right, and showing how tractor cut wheat right up to the side of the woods, left



House that served as headquarters for Parrett test, left, and students of State Agricultural College, Manhattan, Kan., who conducted the test and acted as observers



The Parrett with an 8-ft. binder cutting 127 acres of wheat. By control extensions one man operated the tractor and binder

been a few changes of spark plugs since the test was started. To get as complete information as possible the oil used in the engine crankcase has been measured and drained off every 30 hr. In harvesting the consumption was at the rate of 1 gal. for every 50 hr. of work. This was arrived at by taking the difference in weight between oil put in and that drained off. No distillation tests have been made of oil drained off to determine amount of unburned kerosene in it. Such test will be made later.

At night a battery is carried for lighting, with one light showing ahead on the furrow and one behind on the plow or binder. As most of the troubles with the tractor have taken place at night it is possible that better lighting facilities will be required for night work on the farm. There is not the opportunity for observing the working of all parts, and as most machinery is not over 60 per cent as efficient at night as in the daylight, the combustion engine excepted, it is possible that more lights could be used and an

occasional inspection of the tractor made.

Since it started the test the tractor has not been operated more than 25 per cent of its time by factory experts. One of the operators is a sixteen-year-old boy from Wichita who never drove a tractor before and at the start was not in any sense familiar with the Parrett. Formerly he had driven a jitney. Using inexperienced operators was decided upon to make the test approach as closely as possible actual farm operations. J. Levin, factory experimental engineer, is in charge and on the ground all the time.

Staging a test of this character extending over three weeks is not a small problem. The 127-acre tract was secured last May and Parrett assumed responsibility for the complete task. He provided the binder, the threshing machine and the help to do the threshing. It was a complete tractorized test. Over twenty-two men were needed in the threshing time. A farm house was rented, cots rented, cooks and other help

secured and complete working and living headquarters established. Spray baths were installed and an office for the college crew fitted up. As a result Dent Parrett, president of the company, will have at the completion of the test the most complete and reliable mass of official information accumulated in years. Not all the national tractor demonstrations of the last four years would furnish him with what he has obtained. There has been much good to the industry. This is the first big attempt to provide that mass of data that the industry should have. The entire merchandising organization for the country is in need of such. A few more tests of this character would do much to put an end to the overselling and overrating of tractors which has become too common. A hundred tests of this official character would do more substantial benefit to the industry than a hundred national demonstrations. Facts on performance is what the tractor industry needs, and Parrett is furnishing them.

A Season's Work in Thirty Days

Fordson Tractor Test at Wichita

WICHITA, Kan., July 12—Crowding a season's work into thirty days; plowing, disking and seeding an 8-acre tract where now stands a crop of cane over a foot high and the tractor engine, as yet, not shut off are two of the odd facts in connection with the thirty-day non-stop tractor test being conducted here by the Watson Tractor Co., distributor for the Fordson.

The test was begun June 16 at 8 o'clock in the morning, and to date the tractor has cut 220 acres of wheat, dragged 44 miles of road, plowed over 100 acres, to say nothing about cutting feed, sawing

wood, and other farm work. It is the intention of the Watson company to run the machine out to Tyler, where the National Demonstration takes place next week, and there put it to work, incidentally finishing the thirty-day run on Tuesday. After the test is finished, it is claimed, the work done will be equivalent to that of an entire season on an ordinary 160-acre farm. Only 5½ min. were lost on the first day, when the engine had to be stopped owing to an inexperienced operator. Since that time, the engine has been run day and night and considerable plowing has been done at night. The day operators usually lay out the field for the night men.

Three Shifts Used

Each operator, of whom there are three, has an assistant and works 8 hr., thus making three shifts. Kerosene is used for fuel, and at the end of every 12 hr. about 2 gal. of the crankcase oil are drained as a precautionary measure and 2 gal. fresh oil introduced. There is no elaborate staff of mechanics, or a host of extra parts, or accessories on hand, nor is there anything out of the ordinary about the tractor—it is simply a stock Fordson bought by the Watson company from one of its dealers. The only accessory piece of apparatus on the field consists of a small trailer in the vicinity where the tractor works, carrying a barrel of oil and kerosene. The operations, since the start, have been observed by a representative of the Wichita chamber of commerce.

At present the work is being conducted on the 250-acre farm of Louis Wolf, who incidentally was very adverse to any kind of a tractor. The Watson company obtained permission from Mr. Wolf to work his farm, and soon after the tractor had begun Farmer Wolf became a potential

buyer and now the Watson company has his order for a tractor tucked away in the safe.

There is nothing of the circus stunt connected with this test. No one would know it was going on merely by watching the tractor work. But the Watson company expects to glean some very pertinent facts about motorizing farms. No attempt has been made at plowing fields in record time; rather the major thought has been to see how good a job could be done and how well able the machine is to cope with it.



A sunshade and lights for night driving were fitted to the Fordson for the Wichita test



E. E. Denniston, manager of the tractor department, Watson Tractor Co., and L. A. McKinney talking it over

[illegible]

After the repair order has been signed, the assistant service manager makes notation from it of the work to be done in his tickler card index that always is on his desk. This notation includes the repair order number, the customer's name and that of the workman assigned to the job, in addition.

At the end of each day the first floor daily service records and the records of the long jobs are sent to the assistant service manager's office. From these he makes out on a form card the same size as the first floor daily service record, the customer's personal record, which affords spaces for data for one year. There then will appear on each customer's card a record of all the short and long jobs done for him. This card is filed where it can be referred to by serial number or customer's name in a jiffy. The assistant service manager also fills in on this card data, from the repair order after the customer has paid his bill, that may be useful.

The customer's personal record has spaces for the following entries: Serial number; customer's name; month to be checked showing when work was done; engine number; date of sale of car to customer; customer's telephone number; dates of inspection service; date of work by day of month; work order number, "policy" parts worked on; "policy" labor; amount collected and remarks. These records are filed in a special binder.

On the mechanic's time card, which

Service manager's summary record—This card, 7½ by 11 in., is white. There is one for each customer, and entries are made on it as rapidly as items of repair are finished. A customer's bill as far as work has proceeded can be made up immediately from it.

Repair charge envelope—This buff receptacle, 6¼ by 8¼ in., is used as the container for the repair order, time card and all requisitions and other expenses on a car when the work has been completed. It is filed in a cabinet

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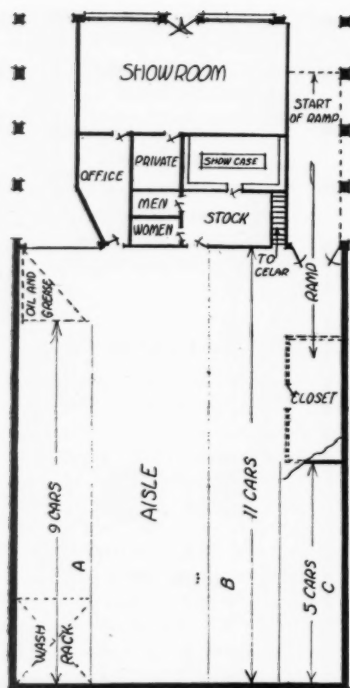


Fig. O

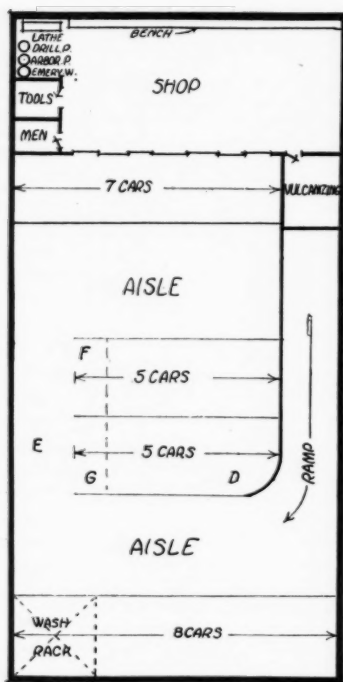


Fig. P



Fig. Q

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

Standard Layout for 60 Ft. Garage

Different Methods of Car Arrangement for Buildings This Width

IN addition to the advantages of a ramp, or inclined driveway, in place of an elevator as a means of reaching the second floor, this plan, Figs. O, P and Q, is an interesting novelty because the side windows of the showroom are almost as exposed as if the building was located on a double corner, because of the open driveway construction as shown.

The exposed driveways allow plate glass windows to be used on either side of the showroom, thus providing maximum light for the showroom unit and also enhancing the value of the showroom as a display to be viewed from the street, since cars can be seen to better advantage with this construction than without it.

Double-Driveway

This double-driveway design, of course, can be used with any building whether it has a ramp or not, but it is usually not necessary to provide more than one entrance, unless a ramp is used, for a building of this size. This statement is a little bit contrary to popular opinion, for there are many buildings of this size with two driveways, but to have them is a mistake as the traffic does not warrant it except in such an example as shown herewith, where it was desirable to provide a direct ramp entrance from the street.

It also should be noted that even though a single driveway is employed there is nothing to prevent the use of this open construction unless the ele-

vator happens to be located in the front part of the driveway.

Inasmuch as the building frontage must be considered as exceedingly valuable display space with a corresponding advertising value whether it is used to advertise cars or accessories, it is a waste of this space to provide more than one entrance of any sort unless there are good sound reasons for so doing. Incidentally, for the same reason, the

Complete dealer plant
Plot 60 by 130
Corner or inside location
One or more stories

entrances should be no wider than necessary—about 10 ft.

In this particular plan, however, it was quite necessary to provide a separate entrance for the ramp. The reason is found on the second floor plan, Fig. P. To secure an economical car arrangement it was necessary for the cars coming up or going down to swing directly from the ramp into the aisle. So this fixed the upper position of the ramp. As a rule, the most satisfactory slope is 15 per cent. Actually a slope of slightly over 16 per cent was used, bringing the front end of the ramp within 10 ft. of the front building line.

If the plot had been longer than 120 ft., say 150 ft., then the ramp could have been pushed back 30 ft., thus bringing the beginning of the ramp and the actual entrance to the first floor of the garage abreast of each other, and permitting the ramp entrance driveway to be used for both first floor and ramp, eliminating the other driveway.

Curve of Ramp

The curve of the ramp at D, Fig. P, should not interfere with the storage of a car at this point, since this does not represent a wall or a curb but simply shows the junction between the slope of the ramp and the level floor. It is possible to back a short car into this space, particularly if there is a short car right behind it. Such a plan will prevent any loss of storage space and at the same time will allow cars the necessary radius to swing from ramp to aisle.

The ramp might be used in a building of this general layout, even though it was as short as 100 ft., in which case the ramp would begin at the front building line, even though this would largely curtail the side window space. For the sake of space economy it is necessary for the top end of the ramp to meet the car aisle—a special cross aisle for the ramp alone would be an unwarranted waste of space—therefore, the possible length of the ramp is about 80 ft. If the distance between floors is 15 ft. then the slope is nearly 19 per cent. This is permissible, although a slope of 15 per cent

is considered standard. If desired, the steepness may be reduced slightly by continuing the slope of the ramp for about 10 ft. into the cross aisle, which brings the inclination down to 16.6 per cent. This can be done without reducing the car storage space fronting on the slope, since the floor may be paired off to the slope of the ramp.

The advantages of the ramp are that it is usually cheaper—if we consider only the space which it occupies—regardless of the size of the building in which it is used, and it is quicker. It makes an upper floor just as valuable for storage purposes as a ground floor, for it only takes a few seconds to drive the car up or down it, as compared with a half minute or a minute or more when an elevator is used. Furthermore, its capacity is almost unlimited. An elevator can only take one car at a time and at morning or evening rush hours there may be a long waiting line. With the ramp, on the other hand, these cars may go up or down almost as quickly as a single car, since they may proceed in a practically unbroken stream.

Why Ramp Is Cheaper

The statement that a ramp is cheaper may surprise some readers, but it is a fact. Due to the high cost of elevator equipment, a standard elevator as furnished by the largest concerns will cost more by the year when all the expenses are totaled, including operator's salary, interest on investment, depreciation and maintenance than the ramp will, figuring its cost as the rent of the space it takes up—and this holds for garages even in the large cities.

No recent figures are available as to the cost of installation of some of the small, simple, slow-speed elevators used in many parts of the country, particularly where the elevator traffic is not heavy, but it is believed that in some cases these may show some saving over the ramp.

Some object to the ramp because they claim it is dangerous. Experience proves that it is safer than an elevator. The grades used are no steeper than on occasional hills, and most motorists have no difficulty on this score. Even when a single track ramp is used, there should be no cause for collision provided a large mirror is placed on a level with the driver's eyes at any turn. A ramp wide enough to allow simultaneous up-and-down traffic is unwarranted except in the largest garages.

When the garage space is so large more than one elevator is required, the saving by the ramp becomes greater, and where several elevators are required the saving is very great indeed, since only one ramp is needed regardless of the number of elevators it replaces.

Having said all these things in favor of the ramp it is necessary to point out that, notwithstanding the advantages mentioned, it is better to use elevators in a great majority of cases. In the first place, we shall not say that a ramp may be inadvisable because of the space it takes up, because space has a dollars and cents value and we have already stated that the ramp is cheaper. However, this is true: That to use a ramp in many buildings, particularly those less than 60 ft. wide, so affects the remaining space that the resulting layout may be much less desirable than if an elevator is employed. There is no hard and fast rule on this matter. Each case must be considered on its individual merits.

A ramp is usually not suitable for a building less than 60 ft. wide, and this is why no mention of it was made in the plan for a 50-ft. plot. Suppose the overall width of the ramp is 11 ft. and the side walls of the building are 1 ft. thick. This is 13 ft. off of the width of our building, leaving a strip of 37 ft. in which to store cars—only one row of cars and an aisle could be located on such a strip. As previously explained

to store two rows of cars with an aisle between requires 50 ft. in most cases, and to maintain this width and still use a ramp requires a lot that is over 60 ft. wide.

The inside width of the ramp never should be much under 10 ft. to insure safety for pedestrians and also to allow passage of large trucks.

Although the ramp may show a saving over an elevator when the rent of the space it actually occupies is figured at so much a square foot, at the same time the use of a ramp might be costly. It will be remembered that with a garage 65 ft. wide three rows of cars may be stored, but if a ramp is used one of these rows must be eliminated. This condition is also shown in Fig. O. In this case the ramp only partly eliminates row C. From this it is plain that on plots 60 to 70 ft. wide using a ramp or an elevator means getting revenue from row C or not. If a man prefers a garage without row C, then there is no argument. He should use a ramp. But if he wants row C, then he had better use an elevator.

Not Good for Corner

This plan is not particularly good for a corner plot, as it might be more desirable to have the ramp entrance at the side. For the sake of having an extra fine showroom, the accessory store is placed in an alcove at the rear and window display of accessories is not provided for. This arrangement is very good for the dealer who concentrates on cars and carries accessories as a side line. Such a layout is advisable in a large town where adequate accessory stores are operated by separate individuals, but in smaller towns where there are not such good stores it is advisable to give the accessory store more prominence. The average dealer will obtain greater returns from his business by pushing accessories just as hard as he does cars.

Garage Planning

Service Station Arrangements

No. 79

Ford Station on Irregular Lot

Q—We are building a garage 50 by 100 ft. and would appreciate suggestions on a Ford sales and service station with the following conveniences: Women's and men's restrooms, vulcanizing room, radiator repair bench, lathe, emery and burning-in machine. We will carry a \$1,500 stock of accessories and parts. Kindly show these arranged to the best advantage.

Our location faces a lake so would you suggest a two-story frontage with restrooms on the second floor. Our idea also includes storage room for about twenty-five cars.

The building will be constructed with a lattice truss and a round roof.—R. A. Chambers, Houghton Lake, Mich.

You certainly have a badly shaped lot to handle. If there were one single square corner, one would be relieved and know where to commence.

We believe it would be wise to build out to the lot line on both streets and if there is more space than you want to use, leave some of the back open. Where space is left beside a building as shown in your blueprint, the tendency is to run in a lot of old battered-up relics of the past, to end their days in rust, thus giving the appearance of a junk dealer's yard or a motor car graveyard, neither of which is indicative of live business.

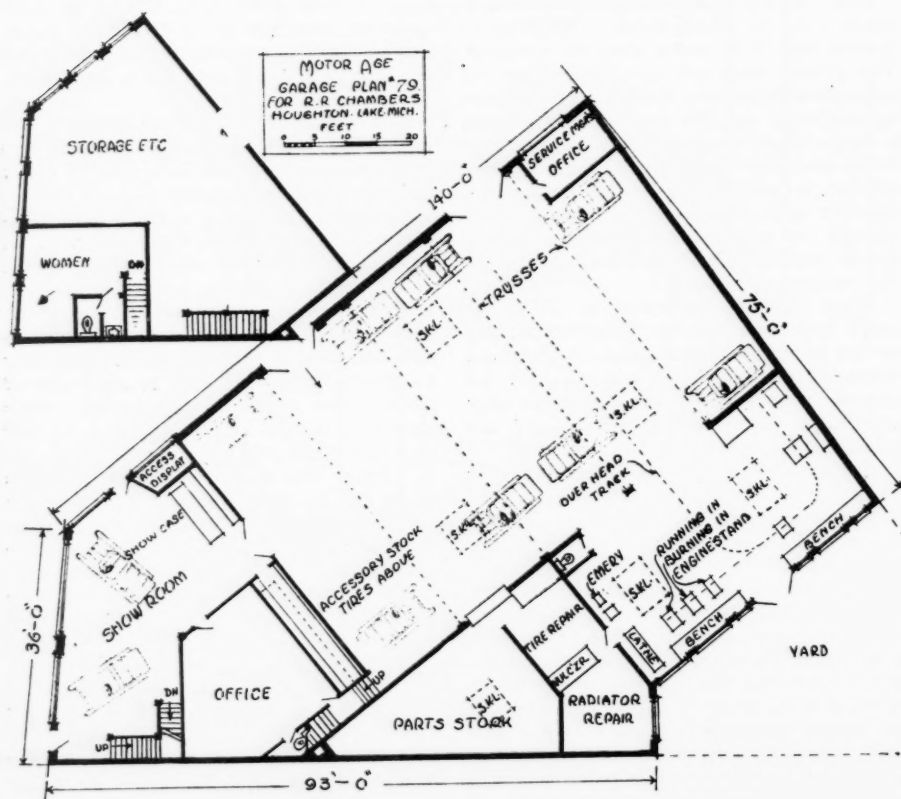
Should Use All Space

You should use at least all the space shown. The writer was in a Ford station 50 by 150 ft., the manager of which complained greatly at the lack of space. They had dispensed with the showroom and cut the office to almost nothing, carried no accessories and did no stor-

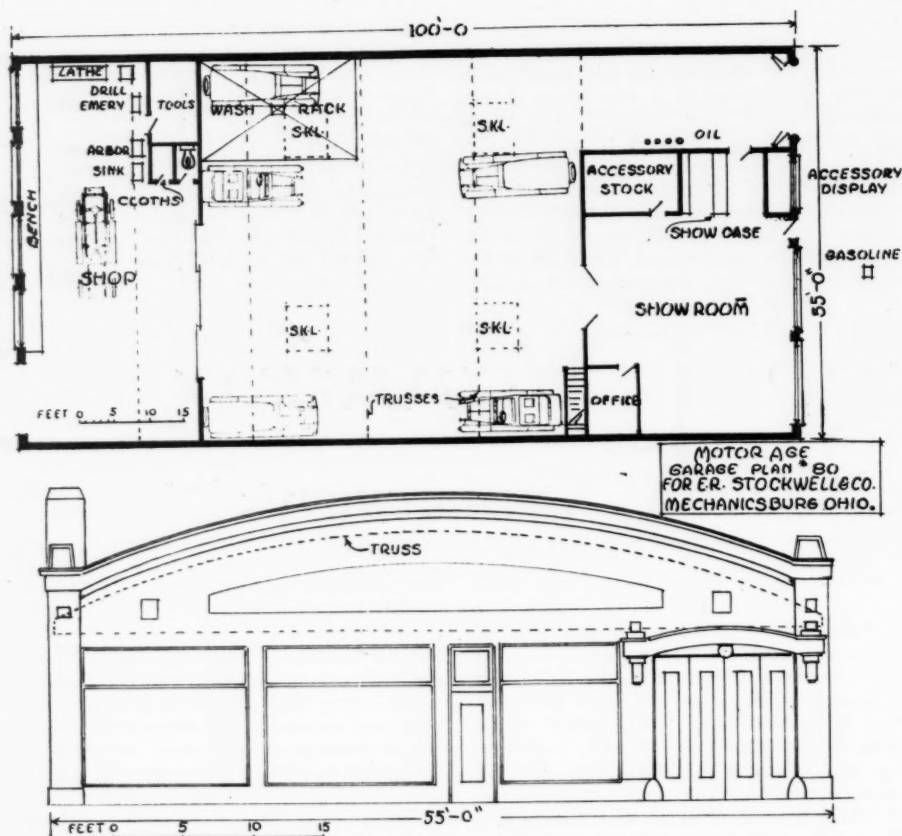
age business and were still in need of space.

Your idea of the women's room on the second floor is a good one, but it would not pay to build this section for that alone. You probably can use the front part for some special workroom, possibly trimming or top work. A doorway could be made at A, just under the garage roof and large parts hoisted through when necessary.

The shop should be equipped with all the up-to-date special service devices and have an overhead track with traveling hoist. We would suggest using the south end of the garage for the service end, as this is in direct communication with the shop. The part of the building containing the shop, parts stockroom,



A rather unusual site and the garage and showroom, etc.



Transverse section and floor plan for garage, showing arrangement of trusses among other things

etc., may be built in the form of a lean-to on the main building, the rounded roof of the garage continuing unbroken

except perhaps to have a less abrupt pitch.

The ceiling of the office and salesroom

may be not to exceed 10 ft. so the part containing the second story would not be excessively high, while the common practice in the garage is to give 12-ft. headroom under the trusses.

The heating plant naturally locates itself under the office and is reached by a stairway under the one to the women's room.

No. 80

Suggesting Plenty of Lights

Q—Give plans and specifications for a garage 55 by 100, showing front elevation, showroom, office, accessory department, toilets, washrack, workshop, furnace, lights, etc., to be built of vitrified tile or brick, with no posts between showroom and workshop, on lot 59 by 115.

About two or three cars in showroom, one desk in office, ten or twelve cars in garage, three or four cars in workshop, no battery work. No waterworks in town. Drive well inside. Small town, less than 2000, mostly Buick cars to handle. Expect to employ about three men in shop. One story building is wanted.—E. R. Stockwell & Co., Mechanicsburg, Ohio.

MOTOR AGE does not furnish specifications or estimate costs and our plans are not complete working plans, though a good experienced builder ought to be able to take them and supply the necessary details thus using them in building operations. Where trusses, heavy timbers or steel beams are to be used an architect should be consulted in regard to these details of the proposed building, if nothing else.

Place for Furnace

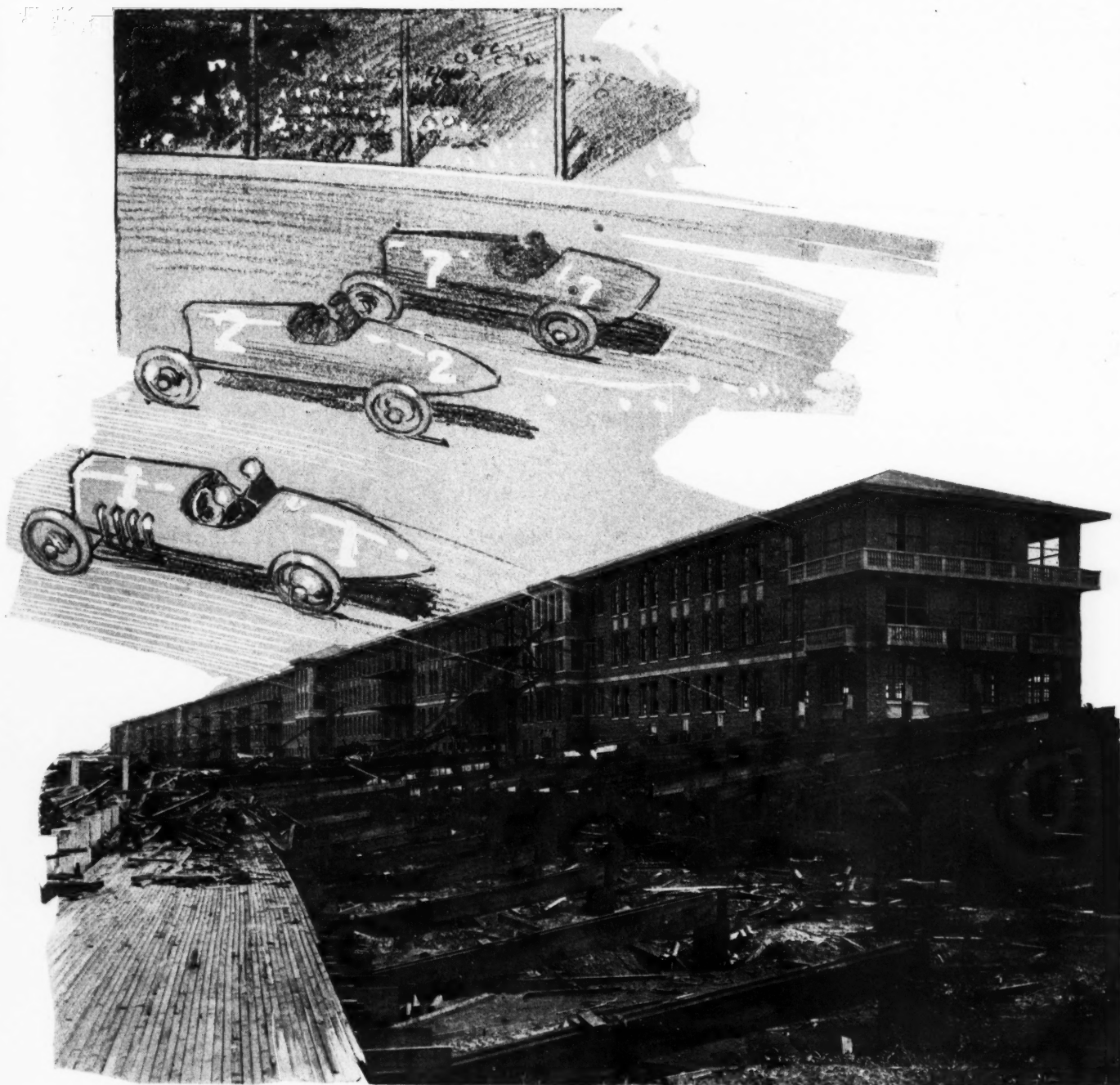
We have not shown the furnace room, but the best place in most cases is under the office or showroom. Here it would be a narrow excavation with coalbin in front or under the sidewalk and boiler behind. Also we will not attempt to place the lights but recommend that you use plenty of them and have them controlled from convenient switchboard. The board controlling the garage lights, for instance, should be near the front door, so the night man could switch on a light anywhere to assist a late arrival in reaching his stall. The washrack should be well lighted. In this section the night man does most of the washing, though things may be different in Ohio.

We have not made a thoroughfare of the alley entrance. It does not seem necessary, as there is plenty of room to turn in the garage and if a passage were partitioned off, it would cut down the shop 10 ft. and cut the storage capacity two cars.

MICHELIN INSURES EMPLOYEES

Milltown, N. J., July 11—All employees of the Michelin Tire Co. will benefit by an insurance plan to present each one with an individual life insurance policy for varying sums, depending on their years of service with the company. Every employee will receive free of cost a life insurance policy graded according to length of service from \$200 for six months to \$1,200 for ten years and over. Each new employee will be insured upon completion of his first six months with the company. Each employee received an individual policy which became effective on June 16.

Shades of Past Events About All That's Left of Chicago Speedway



Where are the races of tomorrow to be held? Not on Chicago's speedway anyway. For reason why see above. When the President signed the general deficiency bill \$3,000,000 were made available for the purchase and completion by the Government of this hospital, which is erected on the site of the Chicago speedway. The board oval has been partly wrecked and, a mere skeleton of its former self, this is how the speedway looks today

Washington, July 11—Complete abolition of price cutting on cars, trucks and parts may result from a recommendation made to Congress to-day by the Federal Trade Commission, when that body suggested a law which would enable manufacturers to fix retail prices and compel dealers to abide by them. That manufacturers should be permitted by law to fix and maintain resale prices subject to review by a disinterested agency was the recommendation of the commission.

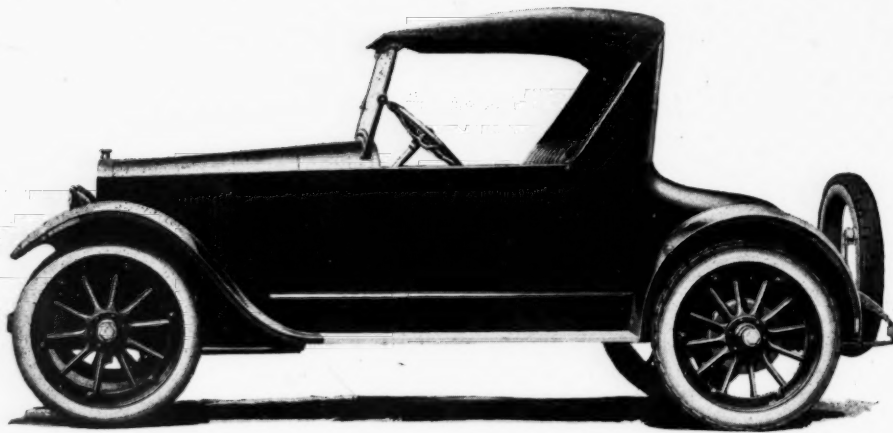
ASKS POWER TO FIX PRICES FOR RETAIL SALES

The commission, which made a similar recommendation last December, believes purchasers of identified goods should be protected in their intangible property right created through the influence of fair dealing and sustained quality of merchandise, that unlimited power to fix and maintain resale prices cannot be made lawful with safety and also that unrestrained price cutting is not in the

public interest and in the long run tends to impair and destroy production and distribution. Consequently the commission urges that an agency should be created by Congress with which manufacturers desiring to fix and maintain resale prices would file descriptions of their articles, contracts of sale and price schedules to be maintained. The disinterested agency would be charged with the duty of reviewing terms or contracts and prices upon complaints of dealers or consumers.

Cleveland Car Now Ready for Distribution

Touring Car and Roadster to Sell at \$1,385 Each



The roadster which, with touring car, completes Cleveland line so far

CLEVELAND, Ohio, July 14—The Cleveland car has had an unusual history from the dealer's standpoint. Up to last Friday night no dealer in the country knew the price of the car and yet at that time practically every territory in the country had been closed. Because of the closeness of the relationship between the Chandler company and the Cleveland company the car has been accepted by dealers from the first announcement that the Cleveland company financed and directed by the same interests as control the Chandler would put out a car. The car will sell for \$1,385.

The car is an overhead-valve six mounted on a 112-in. wheelbase with a five-passenger body. A roadster will be marketed at the same price, and later a full line of closed bodies will be produced. It is a product of both the Cleve-

land company and well-known parts makers. The engine and axles are of Cleveland design and manufacture; the clutch, Borg & Beck, Mechanics Machine Co. transmission, Gray & Davis lighting, starting and ignition, Mechanics universals, and the body will be manufactured by the Fisher Body Co.

The engine is a detachable-head unit, the cylinders cast in block. The valves are operated by rocker arms, the entire valve assembly being in a unit with the detachable head. The cylinder dimensions are 3 by 4½ in. and the valves are 1½ in. clear diameter.

Cast-iron pistons with three rings, all above the wristpin, are employed. The piston pin bearing is in the top of the connecting rod, which is bronze bushed. The rings are 3/16 S. A. E. type, and the practice of using S. A. E. standard fittings and dimensions has been adhered

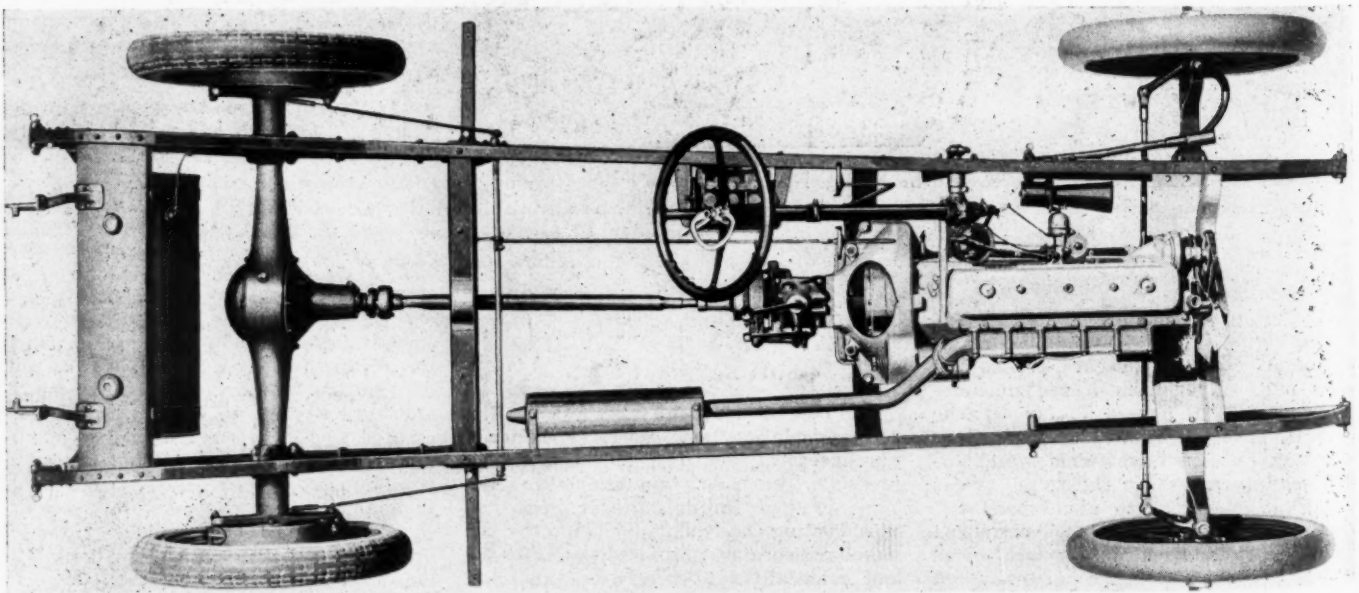
to throughout. The crankshaft is carried on three bearings lined with die-cast babbit. The shaft diameter is 2 in. at the main bearings and 1½ in. at the crankpins. The crank cheeks are curved for inherent balance the bearing lengths are: front, 2¾; center, 2½ and rear, 3 5/16.

Morse chain drive is used for the camshaft and generator, the chain being 1¼ in. wide and ½ pitch. The camshaft, which is located in the crankcase, is 1 in. in diameter and can be removed by pulling out endwise after taking off the chain cover. The valves are driven through mushroom tappets and vertical pushrods to the overhead rockers, which operate directly on the valve stems. The rocker shaft is made in two parts of seamless steel tubing with a wick core. The wick is supplied by two overhead oilers, each of which takes care of one part of the tubular shaft which extends over three cylinders. The clearance adjustment is made by a setscrew through the end of the rocker arm at the point of contact with the valve stem.

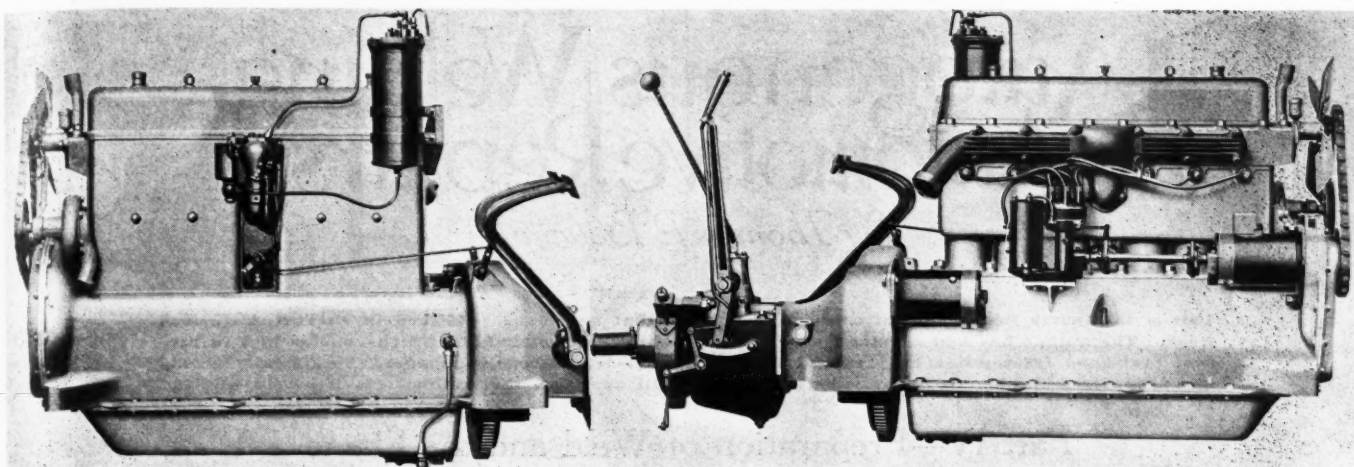
Hot-Air Stove

No hot spot is employed on the intake manifold, this being incorporated in the intake casting and subject to the heat of the waterjacket. A hot-air stove is employed to warm the air before it is brought to the 1-in. Stromberg M. B. carburetor. The exhaust manifold and the intake opening at the stove is on the left side of the engine and all the electrical equipment is mounted on that side also. The gasoline equipment, including carburetor and Stewart vacuum tank, is on the opposite side, free from danger of backfire.

Oiling is by pressure through a hollow shaft to the main and camshaft bearings.



Plan view of chassis of the Cleveland car, showing layout of new machine



Both sides of the engine fitted to the Cleveland chassis, showing their equipment

An oil lead also is carried to the chain-case, these leads being supplied by a gear pump located in a sump at the rear end of the pressed steel oil pan and driven by spiral gear off the end of the camshaft. An oil pressure gage is supplied on the dash. Lubrication of the pistons and all other working parts of the engine is taken care of by spray from the splash system.

Pump cooling is employed in connection with a Mayo radiator. The water-pump and fan are driven by an endless V-belt off the generator shaft. The cooling system has a capacity of 3 gal. and is noteworthy in that there is water between adjacent cylinders. There is water also around the spark plugs, which are screwed into the sides of the cylinder casting, the points being in a recess to prevent fouling.

Hotchkiss drive is employed, the rear axle being a floating type with some important features as regards accessibility. The pinion shaft assembly, for instance, is a unit, being mounted on two Timken bearings in an independent carrier which is screwed into the housing. Adjustment of the pinion is easily made by screwing in or out on this carrier by a notched ring. Adjustment of the bearings is taken care of in the usual manner by adjusting nuts, which can be moved without affecting the pinion. The differential is a conventional bevel type.

A transmission handbrake is employed with the service brake a contracting type on the rear axle. The front axle is an Elliot type with steering by the worm and sector Detwaller assembly. The tire size is 32 by 4 with the Firestone rims as standard. The wheels are wood spoke. Semi-elliptic spring suspension is used with 38 by 2-in. fronts and 52 by 2-in. rears. On the five-passenger cars these will be eight-leaf springs.

The equipment consists of a one-man four-bow top, Johnson curtain lights, nickel-bound door-opening curtains, Van Sicklen speedometer, ammeter, choke, ignition lock and the usual tool equipment. A feature is made of the hand-buffed leather upholstery employed on this car. It is the long-grain, bright finish style. The roadster will be a three-passenger with a suitcase compartment in the rear deck.

TRACTOR DEMONSTRATION

(Concluded from page 17)

\$1,000, which is some indication of what the future holds for combinations of this character and the prices that may be expected. A new convert has been added to the garden tractor field, and to the Beeman the pioneer in this class has been added the Utilitor of the Mid-West Engine Co. It is a type similar to the Beeman, not yet in production but with factory tooled up.

A trip around all the exhibits, which as usual, are housed in tents near the demonstration field, 7 miles out of the city, brings out the rather general conclusion that Fordson and Samson tractors are the thorns in the side of the industry. You are treated to a continued knocking vaudeville. If Fordson were guilty of half you hear, it would have been out of business months ago. Samson is coming in for its share, but not enough is known about it to permit of too general criticism. It is unfortunate that so few of the makers are aware of the position Fordson occupies and that Samson soon will occupy. Instead of knocking it would be better to recognize what a part these concerns are playing and are destined to play. There is yet not a full enough recognition of the organizations back of these two jobs.

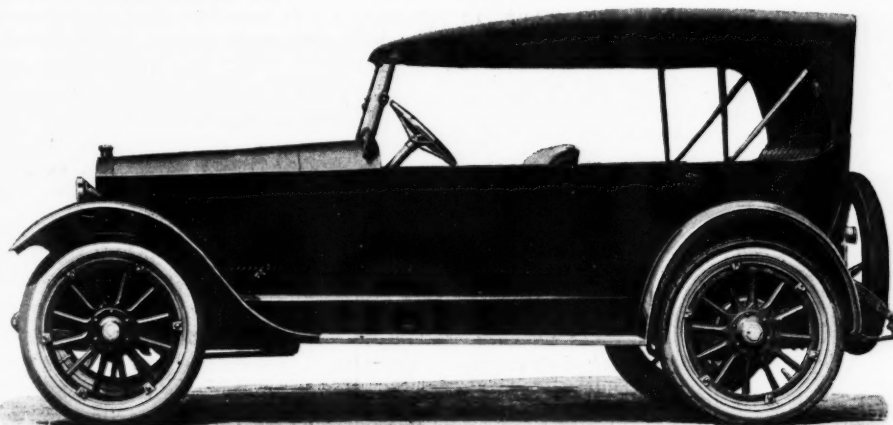
To-day has been a poor dealer day. It is not to be expected that they will be on hand for a day or so yet, if they come at all. Practically all manufacturers, with three or four exceptions, admit that sales have been slow, but the general conclusion is that they have been slow because of poor sales organizations rather than for lack of a market. Those concerns with good selling organizations are not complaining of slow sales.

Pioneer Rumely

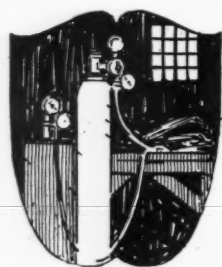
One of the interesting features of the demonstration is the pioneer Rumely, known as No. 1 in the present line of Oilpull tractors. It has been in operation ten years and is credited with having plowed 7000 acres, threshing 750,000 bu. of grain. It will be entered in the plow demonstrations tomorrow.

Another member of novelty row is the trans-continental Wheat tractor that arrived to-day after traveling from New York here.

The special tests of Parrett and Fordson have created very general interest. Parrett has harvested a 127-acre tract and will finish plowing it in a day or so. Fordson has been going through a thirty-day non-stop test of general farm work which will end this week. A third private demonstration is a 100-acre plowing non-stop test by the Fitch four-wheel-drive tractor.



The Cleveland touring car, which will sell at \$1,385



Autogenous Welding in Automotive Repairs

By Thomas P. Bowman



This is the fourth installment of a series of articles that are to be published in MOTOR AGE each week. The author has had practical experience in motor car repairshops which enables him to present first-hand information on practical welding in a clear and concise manner. No difficulty should be encountered in this work, provided the reader will apply all the methods given herein.—Editor.

Part IV—Preparation of Weld and the Flame

THE success of oxy-acetylene welding depends, to a very great extent, upon the proper preparation of the parts to be welded. While the preparation of a weld depends very much upon the particular location and condition of the part to be welded, there are, nevertheless, certain general rules that must be followed. The preparation should be given as much consideration by the welder as are the proper selection of welding rods, fluxes and size of blowpipe head. The weld that is not prepared properly usually will offset any skill the welder may have. Careless preparation has caused many failures.

BEVELING

In making an autogenous weld, it is necessary that fusion penetrate entirely through the metal. To aid this the pieces usually are chamfered or beveled with an air hammer, a grinder or cold chisel. By beveling is meant the grooving or chamfering, of the metal at the line of the weld, the depth of this groove or V being equivalent to the thickness of the metal.

Beveling is not required on castings or plates lighter than $\frac{1}{8}$ in. in thickness. From $\frac{1}{8}$ to $\frac{3}{8}$ in. in thickness a narrow

chamfer only is necessary, one in which the angle opening is 90 deg. is sufficient. From $\frac{3}{8}$ in. up to the maximum thickness weldable by the oxy-acetylene blowpipe, an angle opening of from 60 to 90 deg. is sufficient, the angle being dependent somewhat upon the nature of the material and the location of the weld. It is not sufficient merely to separate the edges, because in this case the upper corners will be melted down and will flow into the space between the pieces, adhering to the sides rather than fusing intimately. This does not produce a weld in any sense, as experience speedily shows.

Under certain conditions it is possible to use an oxygen cutting blowpipe for beveling. In case this is done, care must be taken that all the oxide produced on the surfaces cut by the blowpipe be removed before welding.

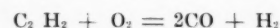
SETTING UP WORK

Before starting to weld it is necessary to adjust or arrange the parts to be welded, so that during the operation they remain in relatively the same position.

It is a common fault of inexperienced welders to overlook this important item, and consequently the strength of the weld, as well as the progress of the work, will be seriously affected. In lining up a piece it is essential that the deviation from the original lines, caused by expansion and contraction, be understood thoroughly and cared for. In preparing castings of non-malleable nature, the adjustment before welding should be done very carefully. This adjustment usually is carried out by straight edges, jig clamps, keys, wedges and other devices.

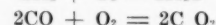
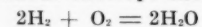
CHARACTER OF FLAME

The combustion of acetylene in oxygen produces a two-phase flame. The luminous cone or jet indicates the following re-action.



The oxygen in this re-action is supplied from the cylinder. It is at this point that the endothermic energy of acetylene is released.

The bushy non-luminous envelope shows this combination:



The oxygen in this phase is supplied by the atmosphere.

The character of the oxy-acetylene flame depends on the proportion of oxygen and acetylene contained in the mixed gas as it issues from the tip of the blowpipe. This proportion is controlled to some extent by regulators or other devices installed with the equipment. The final adjustment, however, should be with the needle valve of the blowpipe. The proportion of oxygen is regulated approximately by adjusting the oxygen regulator to the proper pressure as shown in Table No. 1 of the first installment. The acetylene also is regulated when using a medium pressure generator, or dissolved acetylene from tanks, by various regulators and regulating de-

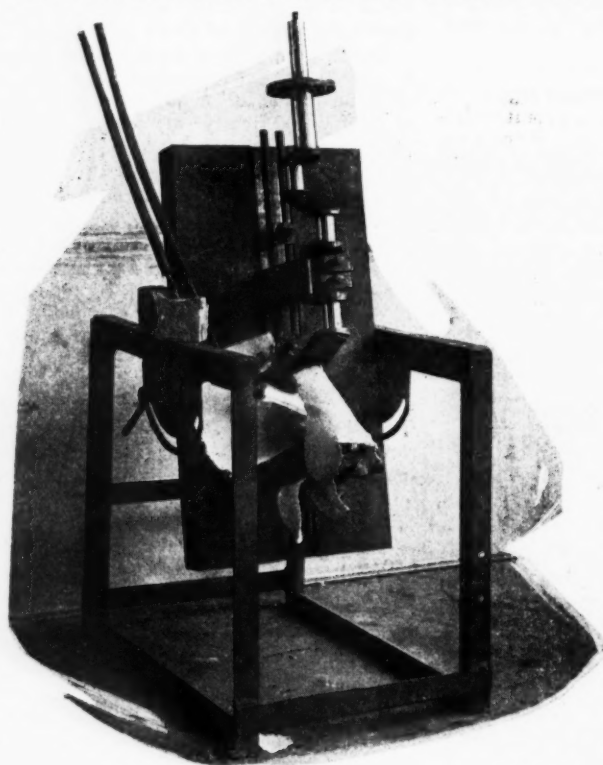


Fig. 12—Method of preheating crankshaft. Sheet asbestos is wrapped around the break, and the flame of the torch is directed toward the covered portion until the preheating has been accomplished.

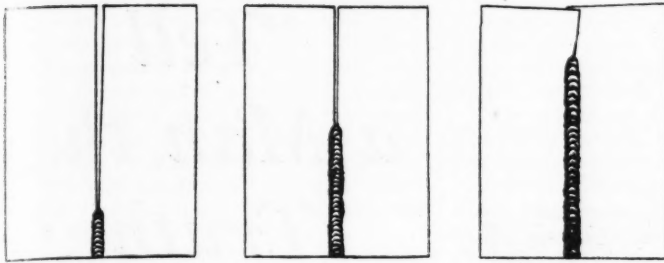


Fig. 13—Three stages of a weld, illustrating what happens in the case of improper allowance for expansion in setting up

vices. In the use of low-pressure acetylene generators it is not necessary to use devices such as this, since the correct amount of acetylene is drawn into the blowpipe by an injector in the welding head or blowpipe. The proportion of the gases may produce three divisions in the character of the flame, called reducing or carbonizing, neutral, and oxidizing. The welder at all times should observe carefully the type of flame produced, and any divergence from the type desired should be detected and corrected instantly.

REDUCING OR CARBONIZING FLAME

When the blowpipe first is lighted the acetylene is greatly in excess. The flame produced is of abnormal volume, a dirty yellow color, and of uniform consistency. This is the reducing type in an exaggerated degree. By increasing the oxygen pressure the size of the flame is lessened, and gradually a white zone of greater luminosity appears near the blowpipe tip. This luminous zone is not yet clearly defined. The flame is still of abnormal size, is streaky in appearance and a brilliant white. The extent of the reducing, or carbonizing action of the flame is judged practically by the size and definition of the luminous zone. When the luminous zone becomes more clearly defined and takes the form and color of a bluish-white incandescent cone or pencil, the streakiness is diminished and the flame approaches neutral. The reducing flame is used to some extent on certain alloy steels, aluminum and non-ferrous alloys.

NEUTRAL OR NORMAL FLAME

When acetylene and oxygen are ignited in the correct proportions a neutral flame is produced. The appearance of this flame is characteristic. It is made up of a distinct and clearly defined incandescent pencil or cone of bluish green in

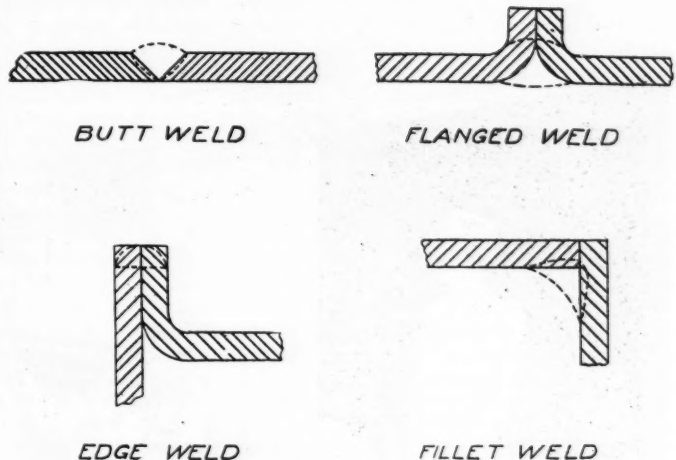


Fig. 14—The dotted lines indicate the various types of welds

color, surrounded by a faint purplish yellow secondary flame or envelope of bushy appearance. The incandescent pencil or cone may be from $\frac{1}{4}$ to $\frac{5}{8}$ in. long, and usually is rounded or tapered at the ends. The maximum temperature of the oxy-acetylene flame is $\frac{1}{8}$ to $\frac{3}{16}$ in. beyond the extremity of this jet. In establishing a neutral flame the jet should be of the maximum size for the particular blowpipe head in use. This flame is established by gradually increasing the oxygen supply until the point at which the incandescent jet is of the greatest clearance is just passed, and then finally adjusting by decreasing the oxygen supply until the desired condition is obtained. This type of flame is one of the most extensive used, and no welder is proficient until he is thoroughly familiar with its appearance and distinguished characteristics.

OXIDIZING FLAME

When an excess of oxygen exists in the welding flame it is called oxidizing. The effect of too much oxygen is to diminish the size of the flame, blunt or blur the incandescent cone and produce a weak, streaky or scattering flame. The oxidizing flame has neither the size nor the illuminating qualities of the reducing flame, but the incandescent flame is slightly more pronounced by its pale violet color. In some blowpipes the incandescent cone is not only diminished in size but is slightly bulged at its extremity as compared to the normal flame. It is rare that a welder has occasion to use this type of flame, and hence he should be particularly careful regarding its use.

G. M. C. STOCK WIDELY SOLD

New York, July 11—Thirty million dollars of debenture 6 per cent stock of the General Motors Corp., issued under the new capitalization of \$1,020,000,000, already has been sold, the distributing syndicate announces. The transaction added approximately 6000 shareholders to the G. M. C. list, a fair share of whom are Europeans.

TO MAKE PORTER CAR NOW

New York, July 11—Quantity production of the Porter car, which has been for more than four years in the experimental stage, bearing the initials of its originator, Finley R. Porter, will be undertaken in September. Manufacturing will be carried on at Bridgeport, Conn., by the American & British Corp., licensed by Porter, a member of the board of directors, as exclusive producer of the machine during the next ten years.

About a dozen F. R. P.'s were put on the market before the industrial curtailment imposed by the war necessitated a

halt in the experimental work, Mr. Porter having joined the engineering forces of the Curtiss Aeroplane & Motor Corp., his son, R. D. Porter, is carrying on the development as chief engineer of the A. & B. Corp. It is expected that production will reach 350 cars the first season.

The Porter, equipped with the Porter engine of more than 100 hp., will be manufactured complete at the Bridgeport plant and will sell for about \$5,000. Its passenger capacity has not been set.

The Morton W. Smith Co., New York, will be the general distributor.

MORE CAPITAL FOR HACKETT

Grand Rapids, Mich., July 11—The Hackett Motor Co. plans to increase its capital to \$3,000,000 from \$500,000, and the directors have been granted authority to change the name of the company. The company has contracts now in production that will keep the factory busy until Aug. 1. Thirty cars of the 104 in the company's export contracts already have been shipped.

WHITE TO MOVE TO LONG ISLAND

New York, July 11—Long Island City, rapidly becoming a center for service stations of sales houses in the metropolis, is to have a new enterprise in a combined sales and service station of the White Co., employing 400 to 500 persons. A building with four-story front elevation and a single story and basement at the rear being erected for the company, which will give up its New York quarters about Dec. 1, according to the manager.

U. S. MECHANICS FOR COLOMBIA

New York, July 11—A. N. Eslava, Buick dealer and pioneer in the introduction of cars in Colombia, announces his intention of opening within a month accessory and repair depots in the leading cities of the South American republic. He will sail for home with two American mechanics, hoping to relieve a situation due to lack of repair facilities and supplies of parts which has doomed to disuse half the limited number of cars in the country.



The man reported that it was in very bad shape and must have an overhauling at once, that it would not be safe to run it another day—the bearings were loose, there was a piston slap, the carbon must be released and the valves reground, etc.

AS Phil Hodgson backed his car out of the tiny frame garage in the yard to the rear of the house and, in reverse, gingerly navigated the straight and narrow road to the street, waving a good-bye to Mrs. Phil as he passed the dining room windows, he was forced to remark to himself—there being no one else to say it to—that it certainly was a peach of a spring day—warm and sunshiny—one of those days when the height of happiness is a car on an open road. Only urgent business at the office prevented him from succumbing to the temptation.

Car in Good Shape

The car had never performed better despite its months of hard service and need for paint, and he congratulated himself that he would undoubtedly be able to postpone its overhauling for another year.

That noon, in response to a telephone call from Mrs. Phil, he piloted the car home, leaving it in her hands for the afternoon.

Three o'clock found her and a party of friends miles from home stalled with engine trouble.

A motorist drew up to help. With more enthusiasm than ability he proceeded to look for the difficulty, poking this and that until, because of or in spite of his ministrations, he coaxed a few unwilling coughs from the mechanism. Thus encouraged, he finally got the

engine going again, completing the ceremony by adjusting the carburetor. The engine ran badly but yet it ran, and he departed amid a chorus of thank-you's, while the car with its load of erstwhile feminine pleasure seekers limped homeward.

Whenever Mrs. Phil opened the throttle, the noise given forth sounded like the original anvil chorus and so when the part finally reached Liveburg she drew up at the first repairshop for help, her guests leaving her there.

A man from the shop appeared and she told her story. He listened to the sound of the engine, pursed his lips, wrinkled his brow and then departed for a strange-looking instrument which was a cross between a telephone and a stethoscope. With its aid he listened some more and then drove the car once around the block.

In consequence, he reported that it was in very bad shape and must have an overhauling at once, that it would not be safe to run it another day. He explained that the bearings were loose, that there was a piston slap in the second cylinder, that the carbon must be cleaned out and the valves ground, etc. She marveled at his almost mystical skill in so quickly and easily diagnosing the trouble.

How a man could walk up to a strange car and after such a short acquaintance and so little investigation tell so much about the condition of its insides was

"Tell a Man the Truth About His Car" Says Bill Strong

little short of marvelous and left her in a state of wide-eyed, open-mouthed wonderment. His recital of what was wrong made her feel that it was indeed fortunate that the car had kept going as long as it had and also that it was lucky that no more damage had been done because of the complication of defects which already existed, that she was favored in stumbling on such an expert repairman. She guided the car painfully homeward, expecting it to collapse at any moment.

When Phil reached home, she told him the tale of woe right from the beginning, even repeating what she could remember about loose bearings, piston slaps and the like. Phil's technical knowledge, based entirely on his experience with this car, was almost as elementary as his wife's but he did know that cars that had run too far without an overhauling were quite likely to fall heir to these and other difficulties. True, he was a little bit astonished at first, in view of the splendid way the machine had operated that morning but concluded that that was the way with cars you never knew when they were going to need attention.

Rather Go to Bill

Something within him told him, however, that he would rather take the car to Bill Strong than to the man his wife had mentioned, although he did not question the competency of the latter. This feeling was natural because even before he had bought his car he had heard about Bill and so he had stopped one day to buy gasoline. The man at the pump made such an impression on him that he came back. He liked the promptness of the service and he liked the get-up of the young man himself. Then he bought his first tire there—at the suggestion of the pump man, and from this small beginning he gradually drifted into buying all his supplies there.

Phil was impressed with the place and particularly impressed with Bill and consequently had always felt his first repair job would be given to him.

So at the risk of a late dinner he and his wife jumped into the car and presently drew up in front of Bill's place of business. Aided by his wife, he told Bill the car needed a thorough overhauling, the bearings were loose, the carbon had to be burned out, etc.

Bill promptly sensed the need for something more than an expert mechanic and so instead of calling a tester tried the car out himself. The engine lacked power and knocked with increasing force as the throttle was opened. Noting this, he stopped and deftly turned the adjusting screws on the carburetor, and, presto, the knocking disappeared. It was caused simply by too weak a mixture—resulting from the ministrations of the motorist that afternoon. Another two or three stops for finer adjustments, and Phil saw that the car ran just as well as it had that morning; in fact, it ran better.

Mrs. Phil witnessed the magic transformation and asked innocently, "How did you cure the loose bearings and the piston slap and all the other things that were the matter with it so quickly and easily, Mr. Strong? This afternoon the man told me that the engine needed a thorough overhauling and you've fixed it in a few minutes."

Ills Never Existed

Bill smiled, for it was an old story. "I didn't cure them for they never existed. The only thing wrong with your car was the carburetor, and that was thrown out of adjustment by the motorist who helped you this afternoon. I cannot explain why your engine balked in the first place. Perhaps it was water in the gasoline or any one of a half hundred other things that may cause trouble once and then go away. But this I do know and that is, his carburetor adjusting only made the matter worse.

"Please don't be misled, however, by this experience," continued Bill, always anxious to talk to a customer. "Next time your knock may be serious. It may not be possible to diagnose it so readily and it may be necessary to tear the engine all apart to fix it.

"To-day's experience should have taught you a lot, and if you don't mind, I shall explain what I mean."

"In the first place there isn't a man alive who can walk around a car once or twice and tell exactly what needs to be done to it. A lot of repairmen pretend they can do this but usually they are just bluffing. Don't misunderstand me. There are some troubles that have quite a distinctive sound, but there are many others that cannot be told from one another.

"The reason for this snap diagnosis lies mainly with the motorist, for he believes, yes, insists, the repairman can tell any trouble right off the bat just by listening to it, and the man who refuses to do this he thinks is a poor repairman.

"When a man's shop is calling for work and he is anxious to get every possible scrap of business and a new cus-

tomer drives in with a mysterious knock and asks what it is, it takes courage for the repairman to tell him he doesn't know but can locate it if allowed the proper opportunity.

"The customer has been used to getting decisions on the spot, and if the repairman doesn't explain the situation to him the way I am doing to you, he is likely to put him down as no good. So the repairman ducks the difficulty by stating that it is a loose bearing, or the carbon needs burning out or he may even suggest that the engine needs an overhauling. Perhaps the symptoms suggest the likelihood of one of these things. We'll say the customer agrees to have the bearings taken up and the repairman gets busy and looks around until he finds the trouble. Maybe he takes up the bearings and maybe he doesn't, but at least the job is of sufficient importance so he can work in a charge for fixing the knock without disclosing his method.

"Furthermore when a car is performing badly, as yours was to-day, and the repairman is at once doubtful of the cause and anxious to get business for his shop, there is a strong temptation to advise a complete overhauling, and this is exactly the advice this afternoon. In one sense any car that has seen more than a very few thousand miles of service is ready for an overhauling, that is, if it is taken apart there are always some things that can be improved, but actually to overhaul a car such as yours would be a waste of money, for it has many thousand miles more service in it.

"Right now I could fill my shop up

"BARGAINS" IN CARS

Philadelphia, Pa., July 11—Farmers are complaining that they have been victimized by men representing themselves as government agents and selling cars at bargain prices. For some time, stories of the Government offering touring cars that originally cost \$1,000 to \$3,300 at figures ranging from \$300 to \$1,200 have been current in the rural districts, especially in the Cumberland valley. Recently several men appeared through the farm sections and succeeded in luring a few men—five have made complaint—into making payments of \$50 to \$200 on "government cars now at Baltimore but ordered for transport to France," said cars to be "delivered within a few days." After collecting the advance payments, of course, the sharpers disappeared.

DOBLE THIS FALL PERHAPS

Detroit, July 11—One may be able to buy a Doble-Detroit steamer this fall, the company says. The Doble-Detroit Steam Car Co. is refinancing and a new plant will be put up to replace that recently sold. In the meantime the company will continue to make its heating system.

OREGON TO SHIP BY TRUCK

Portland, Ore., July 11—Oregon truck dealers have opened a campaign to interest shippers and public in the ship-by-truck movement. Following a successful ship-by-truck parade, demonstration of low costs, speedy service and re-

several times over if I pursued such a policy, but in the end I would lose because eventually my customers would get wise to the fact I was not working for their best interests, just as you have found out the man who advised an overhauling this afternoon.

"Another thing I won't take a car in here until I can start work on it right away. I lost a repair job last week because I told a man I could not start on his car for several days. He took it up the street and there they told him, 'Sure, run it right in.' I happen to know they also are too busy at present to touch his car for a week. I lost that job but I'll gain in the end, for future business depends on honest dealing—you can fool a customer for a time but not indefinitely.

"Now the point I'm coming to is this: We want to convince you so completely that we are offering the very best repair service that we shall have and hold your patronage. To sum up our repairshop policy briefly we aim to:

"1—Tell a man the truth. We won't guess and we won't bluff. If we don't know we'll say so and explain why it is impossible to give a more definite decision on the spur of the moment.

"2—Serve our customers' best interests. We won't suggest repair work or the purchase of new parts unless they are really required. We're not like some surgeons we have heard about who advise an operation whenever they feel the victim has the price."

And it might be added, that months later when Phil's car really required an overhauling, Bill got the job.

liability of truck freight and express transportation now is planned through operation of a special demonstration ship-by-truck line. In addition, a committee headed by F. B. Thompson of the Diamond T Truck Sales Co. has been appointed to obtain exact costs data from other states on truck transportation lines. In charge of the ship-by-truck general committee is C. M. Menzies, Manley Auto Co., in co-operation with L. J. Sparks, Oregon manager for the Firestone Tire & Rubber Co.

CRUDE OIL PRODUCTION

Washington, July 11—A total of 289 refineries are producing 1,295,115 bbls. of crude oil per day in the United States, according to the Bureau of Mines. Following is a list of the petroleum refineries in the United States, with the daily capacity:

State	No. Refineries	Capacity Bbl.
Arkansas	1	300
California	37	280,870
Colorado	2	1,500
Illinois	11	46,000
Indiana	2	36,500
Kansas	31	71,350
Kentucky	2	2,600
Louisiana	12	67,925
Maryland	4	15,500
Minnesota	1	300
Missouri	5	16,375
New Jersey	4	100,000
New York	4	34,500
Ohio	10	24,300
Oklahoma	79	233,300
Pennsylvania	48	90,935
Texas	26	212,050
Utah	1	800
West Virginia	5	7,700
Wyoming	5	52,250
	289	1,295,115

The Readers' Clearing House

Questions and Answers

Conducted by B. M. Ikert

He Built Tractor to Fit His Ideas

* **ROCHESTER, Minn., Editor MOTOR AGE**—I am a farmer's boy and, like most other farmer boys, am interested in the tractor as a new source of motive power. The problem was to find a tractor to fill the needs of our farm, which is about the size of the average corn belt farm and consists of 327 acres. About 70 acres of corn are planted each year, 90 acres of grain and the balance is used for hay and pasture. Part of the land is quite hilly, and there are ditches in some places.

Talked with Many

The natural thing to do in selecting a tractor for this farm is to be guided by the experience of others. As the city near which we live is the home of two of the world's most famous surgeons, people from all parts of the world visit here and, naturally, many farmers, as well as others, go out into the country occasionally while they are waiting for a relative or a friend to get out of the hospital. As our farm is located just outside the city limits we receive many visits from people from all parts of the world, and, of course, I being interested in tractors, will question each about the success of tractors in his locality, about the type of tractors used and the results obtained.

The men to whom I have talked favor tractors as big as the 75 hp. Holt down to the 8-16 size, and many do not favor

any tractor at all. The general opinion seems to be that the big tractor packs the ground too much in some localities, and the small tractor does not do enough work to be an advantage over horses.

The argument that the tractor can work steadier and longer does not hold, as most corn belt farmers have quite a few chores and can only put in a 7- or 8-hr. day in the field, and a well-fed horse can keep right on the move for that length of time.

The more people I talked with, the more confused I became, and so I decided the tractor must still be in the experimental stage and I believe the small tractor still is. I came to the conclusion that a tractor for the corn belt farm must be lightweight and have lots of power. It must be able to plow an acre an hour to have an advantage over horses and must do all farm work, or be able to do so, and be so designed that one man can control both tractor and implement.

I am a subscriber to several magazines so as to keep posted on the last thing in the tractor line, and from the many circulars and catalogs of tractors I wrote for I came to the conclusion that there was but one of two things to do to motorize the farm. The first way is to buy a heavy tractor for the heavy work and a motor cultivator for plowing

the corn. But this would not give any power suitable for pulling the corn harvester or the grain binder, as most tractors that have an acre-an-hour plowing capacity are too big and are geared too low for this work and they require two men for the outfit, which is not at all desirable.

The other thing to do was to get a light tractor with power and speed enough to pull two plows fast enough to plow an acre an hour and to be so built as to be able to cultivate corn and to pull the binder. This looked like the solution of the matter to me. I also decided that one man must be able to run the tractor and the implement and sit on the implement if possible, as many of the farmers I talked with seemed to think that was the only place to be.

I found there was only one tractor on the market that was built like that and I did not think it had the power to plow an acre an hour. So I decided I could assemble a machine which would come up to the requirements I thought necessary, and there is where the fun began.

Has Built Three

I knew it was a big job, as I had built two small tractors before, one while I was attending high school, where I took a course in mechanical drawing, machine shop work and pattern making, in addition to my regular studies.

I learned from experience that a machine should be completely designed before starting on its construction and that nothing could be taken for granted. I often was told, and I have read, that a speed of $3\frac{1}{2}$ m.p.h. was too fast to plow, which is a third faster than the average tractor goes. But I decided to try that speed for plowing anyway.

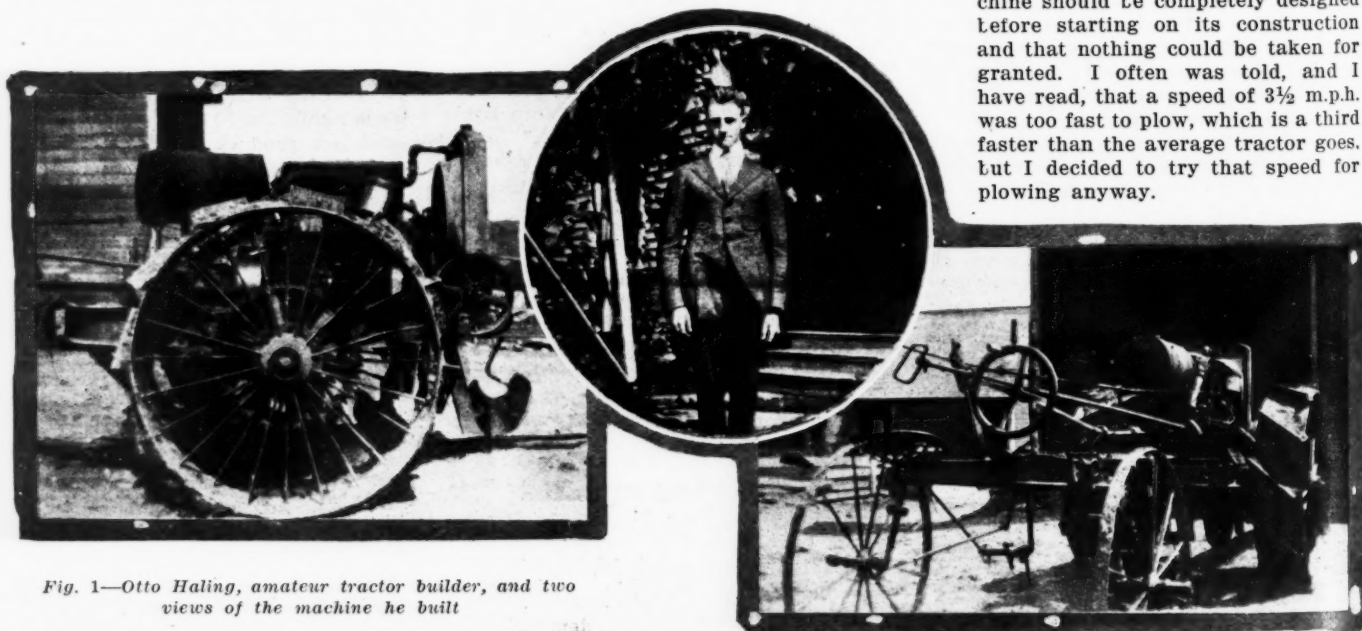


Fig. 1—Otto Haling, amateur tractor builder, and two views of the machine he built

My father bought me a 25-hp. tractor engine of the latest kerosene-burning type, and a friend of mine who is works manager for a certain tractor company furnished me with a single-speed transmission. The wheels were bought from one of the big wheel manufacturing companies, and the gears I obtained from a local foundry.

With this material in hand I completed the tractor after about two months of work done in an old road grader factory which was equipped with lathe, hack-saw, drill press and power punch. When the job was completed I ran the tractor on the scales and found it weighed 3300 lb. with lugs and other equipment.

I built the tractor so all the weight balanced over the two drive wheels and made arrangements to connect the rear end to the machine to be drawn. For plowing I placed two small wheels in back of the tractor to take the torque effect of the tractor when pulling and connected the tractor up to our old gang plow.

The first day of plowing was the most eventful, and the field was soft and wet and the tractor took to the ground like a duck to water. As the ground was soft, the machine would dig itself down. After that when the wheels commenced to slide I would raise the plows a little and I never dug down after that. To my surprise I found that by running one wheel in the furrow I could let the tractor go and get off and walk behind the plows.

Pulled Two Bottoms

The two 14-in. bottoms gave the so-called three-plow engine all it cared for and then some on the hills and proved to my satisfaction that the average three-plow tractor has not more than enough power to pull two plows at a 3½-mile clip, which is not too fast, despite the many arguments to the contrary. A faster speed throws the dirt too much.

I plowed 70 acres this spring and from my experience I found there were dozens of things that could be improved on my tractor. I would never consider less than a 4 by 6-in. engine for a two-plow tractor or less than a 4½ by 6-in. four-cylinder engine for a three-plow machine, and I leave this assertion to anyone who has driven a tractor in all kinds of soil and conditions.

From my experience I believe the powerful, two-wheel tractor, designed correctly, is the coming thing, and I should like to see a tractor of that kind developed and placed on the market, as this type of machine certainly takes well with the majority of farmers who have seen it.—Otto Haling.

Adjusting Gemmer Gear

Q—Would it be practical to cut down the wheels of a Hudson 33, 1911, which has 34 by 3½ tires, to take a 33 by 4 tire?

2—What effect, if any, would this have on the power and gear ratio?

3—Instruct how to adjust a Gemmer steering gear?—A. W. Deney, Fargo, N. D.

1—A 34 by 3½-in. tire uses a 27-in. wheel, and a 33 by 4-in. tire uses a 25-in. wheel. To substitute the smaller tire for the larger and retain the same wheels it will be necessary to cut the felloe of the wheel down an inch in radius. We

O assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

MISCELLANEOUS

Otto Haling..... Rochester, N. Y.
A. W. Deney..... Fargo, N. D.
Frank J. Mohr..... Peoria, Ill.
William C. Hogel..... Chillicothe, Mo.
E. C. Belina, Fairmont Auto & Realty Co..... Fairmont, Minn.
E. F. Isenberg..... Devol, Okla.
Andrew Adle..... Gothenburg, Neb.

ENGINES

Frank J. Mohr..... Peoria, Ill.
Andrew Adle..... Gothenburg, Neb.
Harry Jensen..... Rutland, Iowa
Carl B. Zimmerman..... Alliance, Ohio

CARBURETION

D. A. Wright..... El Paso, Tex.
Walter Goll, General Electric Co..... Fort Wayne, Ind.
Carl E. Sundeen..... Monahga, Minn.
J. A. Hutchins..... Austin, Tex.
B. J. Kirchner..... Riverside, Ill.
Frank Milligan..... Joplin, Mo.

THE ELECTRIC SYSTEM

J. Elzel..... Vallejo, Cal.
B. J. Kirchner..... Riverside, Ill.
William C. Hogel..... Chillicothe, Mo.
Carl B. Zimmerman..... Alliance, Ohio
Fred Harlin..... Itasca, Tex.
M. E. Enoch..... Conlgate, Okla.
Frank Milligan..... Joplin, Mo.
R. Driscoll..... Driscoll, Tex.

REBUILDING

Fred Harlin..... Itasca, Tex.
H. L. Bock..... Hanford, Cal.
Mark Hynes..... Indianapolis, Ind.
D. C. Bugbee..... West Branch, Iowa
No communication without the writer's name and address will be answered in these columns.

do not advise this change, because there will hardly be enough gripping surface left to hold the spoke to the felloe.

2—A change like this would increase the gear ratio and the power.

3—The standard Gemmer gear is shown in Fig. 2. To adjust this for end play loosen the set screw until the adjusting nut does not bind. Then turn the nut until all but the necessary end play is removed. The set screw then

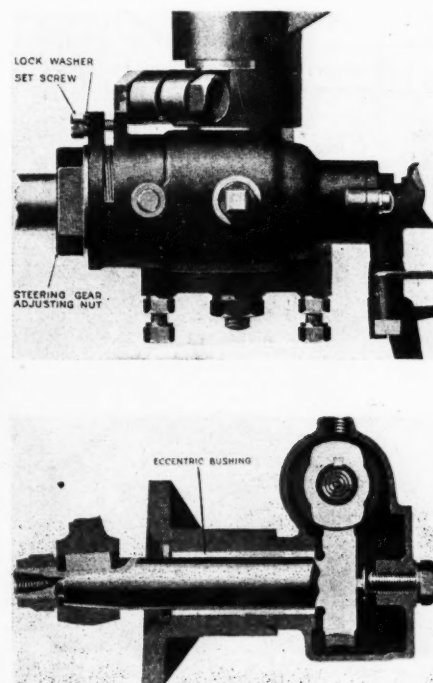


Fig. 2—Two views of the Gemmer steering gear on the Hudson, showing the necessary adjustments

should be tightened. This adjustment does not move the worm wheel closer to the worm, and to take care of this the eccentric bushing must be turned. To bring the worm wheel into closer contact with the worm remove the steering arm and the cover from the side of the steering gear housing nearest the engine. The worm wheel and shaft then may be removed.

Examination of the eccentric bushing will show a series of notches at the end nearest the steering arm. The bushing is prevented from turning by a pin which fits into one of the slots. The pin should be removed and the bushing turned enough to bring about the desired adjustment. The pin then should be replaced and assembly made.

Mileage for Chalmers

Q—About how many miles should I get on a gallon of gas and how many on oil with a 1916 Chalmers 32B?—Frank J. Mohr, Peoria, Ill.

A gasoline mileage of 12 to 14 for this car is very good and can be attained if everything is in good condition.

Grease Works Out

Q—I am having trouble in keeping grease from working out of right rear wheel on a 1912 Hudson 33. Is there any way of putting a felt washer in the rear axle?—William C. Hogel, Chillicothe, Mo.

This difficulty can be taken care of by wrapping the right rear axleshaft with a piece of felt about ¾ in. square. The felt should be in the form of a helix and the direction of advance of the helix should be toward the ring gear when the shaft is in forward motion.

Putting on Ring Gear

Q—Which is the proper way to put on a ring gear? Is hot riveting or cold riveting the best and most practical?—E. C. Belina, Fairmont Auto & Realty Co., Fairmont, Minn.

Hot riveting is the general and accepted method for securing the ring gear to the spider in the factory. This is generally a jig job in the factory, because greater accuracy can be obtained in that way. The contraction of the rivets when cooled causes a firmer set and a better contact between the gear and the spider, so if the hot riveting means is at hand, it should be done that way.

Lowering Hudson Wheel

Q—Publish sketch of how to lower steering wheel on a Hudson 33, 1912 model.—W. C. Hogel, Chillicothe, Mo.

There are several ways in which the lowering can be done. It will have to be done by some shop equipped with special machinery, and we advise you take the problem to them. It is not advisable to drill any more holes in the frame than there are there now because the cross section will be reduced and the frame weakened.

Clutch Lining Is Worn

Q—The Raybestos disk clutch on a 1916 Chalmers 32B slips and when disengaged it drags the shaft so the gears rake before meshing. What causes this?

2—What causes the pinion gear in the differential to break?—Frank J. Mohr, Peoria, Ill.

1—It is probable the Raybestos has become worn so the take-up in the clutch yoke has been turned up entirely.

When this condition occurs the clutch pedal cannot be entirely depressed, because the floorboards prevent it. When the pedal is depressed this far the clutch is not entirely disengaged. This is adjusted by backing the nut off at the rear of the pedal, where the clutch lever enters the housing. Then turn the nut on the other side of the lever further on to take up the motion caused by turning the other nut off.

2—When replacing the broken pinion did you examine the bearings supporting the pinion shaft? If these are broken or worn so the shaft drops slightly below the pitch line level of the gears, then the teeth are very apt to break. It is not probable the rear axle is out of line because the ring gear generally breaks when this is the case. If the bearings are in good shape, examine the adjustment on the pinion. It may be this is forcing the gears too far together. However, if this is the case, the noise produced by the gears would be noticeable. If heavy grease is used in the case, this noise will be absorbed a great deal, and then it is possible the adjustment may be at fault and no noticeable effects produced.

Overland 37 Transmission

Q—When a model 37 Overland is run a short time the transmission becomes hot and the band seems to slip in low and also in high. Show the transmission on this model and give a remedy.—E. F. Isenberg, Devol, Okla.

The transmission is illustrated in Fig. 6. To adjust the high speed first remove the cover A, then see that the clamping bolt on the spider is loose by pulling out the pin D—the spider can be turned—turn to the right to tighten and to the left to loosen. After you have got the adjustment you want, tighten the clamping screw. If you cannot get at the clamping screw, open the cocks over the exhaust valves on the engine, and have someone turn the engine over slowly, while you watch the spider until the screw comes where you want it. The high speed should not be too tight, just tight enough so it will snap in and still pull the car without slipping. To adjust the reverse simply loosen the lock nut B and turn the set screw C to the right the required space, again locking the nut. Adjustment of the low-speed is made in exactly the same manner as for reverse, except that the rear set screw is set for this.

20 by 40 Repairshop

Q—Draw a plan for a repairshop about 20 by 40 ft. I want room for three or four cars to be stored, a lathe, small cylinder grinder, press, workbench, hoist, heavy anvil, driveway at both ends just enough for cars to go through. Suggest at the same time a way that will make the shop the coolest and plenty of light.—Andrew Adle, Gothenburg, Neb.

You will have considerable difficulty getting four cars in a shop 20 by 40 and have any room left to work on them. If you make the shop 30 ft. wide, you will have a clear passage 7 ft. wide and a working space 23 ft. wide left, which is about as little as is practical. After the width of the bench is taken away there will be from 6 to 10 ft. left to work in front of the cars, according as they are

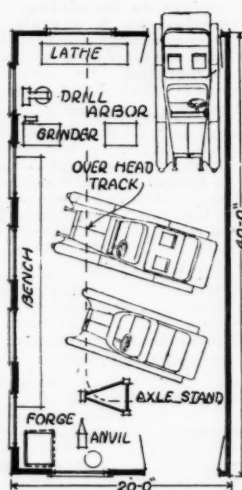


Fig. 3—Small repairshop for two or three cars

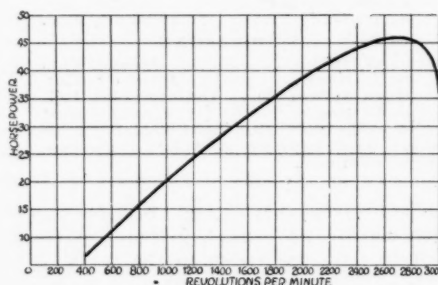


Fig. 4—The horsepower curve of the Oakland six

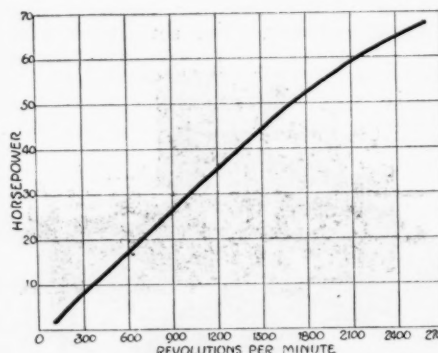


Fig. 5—The horsepower curve of the Nash six

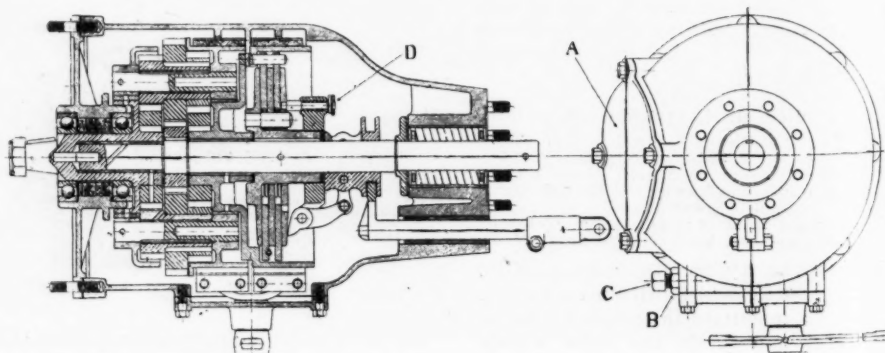


Fig. 6—Transmission used on Overland 37, showing points of adjustments

large or small ones. The cars shown on the plan are a Ford and two medium sized cars, and you can see how they would crowd the shop.

If you make the shop wider, it might be well to have a skylight in the center, but as it is windows along one side and at the ends should give enough light if there are no buildings very close.

The best way to make the shop cool would be to put in a ceiling or even a double ceiling. One air space would insulate the shop from the effect of direct rays of the sun on the roof, but two would be better. If the top of the ceiling joists or the under side of the rafters are covered with some kink of wall-board and the ceiling itself plastered, a very effective insulation would be secured.

Engines

Clearance of Valve Stem

Q—How much clearance should be between the valve stem and rocker arm?

2—Valves Nos. 1 and 5 in a 1916 Chalmers 32B stick when closed and leak compression. Give remedy.—Frank J. Mohr, Peoria, Ill.

1—There should be exactly 0.003 in. between the valve stem and rocker arm on this car. The Chalmers company furnished a gage for this purpose.

2—It is evident the valves need an overhauling. The leaking of compression is caused by improper seating. The seats may be pitted or prevented from making contact by a deposit of carbon. In any event the valves must be ground. In doing this be sure to clean the valve stem thoroughly as these probably are coated with carbon, causing the valves to stick. While the engine is down it might be well to examine into the cause of carbonization. If it is caused by carburetion, the poor fuel probably is doing the mischief. Look to the heating device and see that plenty of heat is given the manifold.

Why Engine Heats

Q—Explain why the engine on a Buick six heats. I have timed it properly, have seen that the pump works properly, have ground the valves, put in fresh oil and adjusted the carburetor and still it heats up.—Andrew Adle, Gothenburg, Neb.

If the engine heats after you have seen to it that the pump works, the timing is right and the carburetor adjustment is right, then there are only two other things causing the heating. There might be a drag somewhere on the trans-

mission system, causing an abnormally heavy load to be imposed on the engine, or the cooling system may have a deposit of some salt which is common in the water in your territory. Examine the brakes and make sure they are not dragging. See that the clutch does not slip and that the transmission has the correct lubricant in it. If all these things are as they should be, then the cooling system might have a deposit or scale in it. This can be removed with the aid of any good boiler compound or with caustic soda.

Various Horsepower Curves

Q—Give suggestion for increasing speed and power of 1913 Hupmobile 32 engine. I would like to tune it up so it will do 2400 r.p.m. or better.

2—Publish horsepower curve of Nash six, Buick six and Oakland six engines.

3—Give weights of Nash six, Buick six and Oakland six.—Harry Jensen, Rutland, Iowa.

1—A few suggestions for speeding up and increasing the power of this engine are: Lighten the weight of all reciprocating parts as much as possible. This means lightweight pistons and rods. A balanced crankshaft should be installed. A correctly balanced shaft will add more to the speed than most any other change. The ignition should be made a double-spark system.

2—The Nash and Oakland diagrams are shown in Fig. 4 and Fig. 5. The Buick diagram is not available.

3—The weights given for the following cars are for the five-passenger, six-cylinder models: Buick, 2970; Nash, 3000; Oakland, 2135 lb.

Timing Velle Engine

Q—Publish instructions to time a four-cylinder 1914 Velle, model R.—Carl B. Zimmerman, Alliance, Ohio.

The timing diagram for this engine is shown in Fig. 8.

Carburetion

Improving Carburetion

Q—On a late 1913 Reo is installed a Bosch magneto and Stewart vacuum tank.

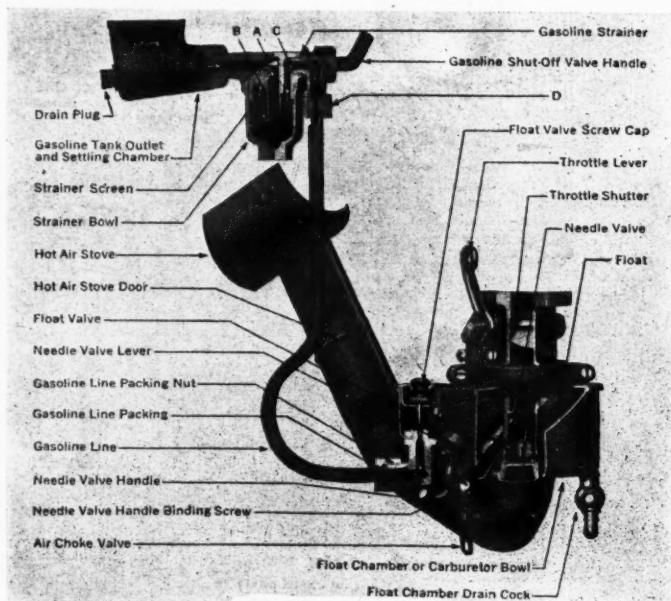


Fig. 7—Carburetor used on the Maxwell, with adjustments

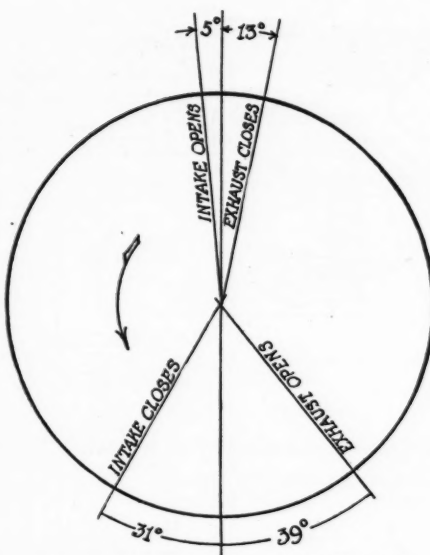


Fig. 8—Timing diagram of Velle engine

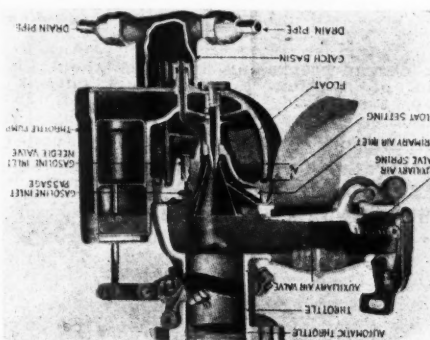


Fig. 9—Cadillac carburetor, with adjustments

I am going to put on a Rayfield carburetor. Do you think there would be any advantage in putting it close to the intake manifold, taking out the short piece now between the carburetor and manifold, or should I let it stay as it now is?—D. A. Wright, El Paso, Tex.

The extra piece in between the carburetor and the manifold will do no

good and will improve carburetion if removed. The tendency for the carburetor to drip after the engine is shut off also will be eliminated if the extra length is removed.

Action of Cadillac Carburetor

Q—Explain the action of the Cadillac carburetor and the function of the dashpot. What is the action of the shutter attached to the right of throttle which covers the slot in the carburetor body? Show sectional view of the carburetor with the positions of the nozzle and air passages.—Walter Goll, General Electric Co., Fort Wayne, Ind.

The Cadillac carburetor is shown in Fig. 9. This carburetor is equipped with a throttle pump, this being the device called a dashpot. It is the purpose of this dashpot to supply a rich mixture while accelerating rapidly. When the throttle is opened rapidly the opening action operates the plunger in the throttle pump and forces more gasoline through the metering orifice. If the throttle is opened very gradually, there is no noticeable effect from the throttle pump.

The device called a shutter is a leaning device. It is the purpose of this to feed less gasoline through the spray nozzle when operating. A hole is drilled through the carburetor body from the mixing chamber to the slot and another hole is drilled from the slot to the carburetor bowl.

When the slot is covered by the shutter a passage is formed from the mixing chamber to the carburetor bowl. The partial vacuum in the mixing chamber causes a lowering of the atmospheric pressure in the carburetor bowl, resulting in less gasoline being fed to the nozzle. When the shutter uncovers the slot the partial vacuum in the mixing chamber has no effect on the atmospheric pressure in the bowl and the amount of gasoline fed through the spray nozzle is not affected.

Adjusting Tillotson Carburetor

Q—Should the reeds in the Tillotson carburetor be closed up tight when the engine is not working?

2—Can the reeds be adjusted, and how? If not, can a new set be put in?—Carl E. Sundeen, Menahga, Minn.

1—The air valve reeds are assembled on the reed cage with the reed lying perfectly flat, and these should not be changed in an attempt to secure a better adjustment.

2—The Tillotson carburetor has but one adjustment. This is the primary nozzle. The adjustment is controlled by the adjusting screw at the bottom of the carburetor. Under no conditions should the reeds be bent to a new position, for the thumb screw does all the adjusting necessary.

Adjusting Johnson on Maxwell

Q—The new Maxwell has a Johnson carburetor with double adjustments. What is the purpose of the two adjustments? The present adjustment seems to be giving the engine too much gas?—B. J. Kirohner, Riverside, Ill.

Probably you mean the two adjustments on the one needle valve of the carburetor on the Maxwell. Referring to Fig. 7, the small bent handle which controls the motion of the needle valve should be set according to the following

instructions: With the engine under operating conditions, that is, hot and the dash control down, loosen the binding screw that holds the valve handle. Turn the handle to the right until the engine begins to slow down. This will be about three-quarters of a turn from the entirely closed position. Then turn the valve to the left until the engine idles at the right speed. To secure the high-speed adjustment, advance the spark and open the throttle quickly. The engine should accelerate strongly without missing or backfiring. This position can be determined and then the mixture enriched by a partial turn of the valve, which will correct the misfiring.

Carbureting Gasoline and Kerosene

Q—What is the principal difference between the carburetion of kerosene and gasoline?—Frank Milligan, Joplin, Mo.

Gasoline is a hydro-carbon, hexane by name, and represented chemically by the figures C_6H_{14} . The boiling point of gasoline varies from 150 to about 250 deg. for very poor grades. Kerosene is a hydro-carbon also, whose chemical formula is approximately $C_{10}H_{22}$. Its boiling point begins where gasoline leaves off. This is the big difference between the carburetion problem of the two fuels. Good gasoline with its low boiling point is readily carbureted without using heat. Kerosene will not vaporize at low temperatures. A cup full of kerosene will remain in the cup practically indefinitely without losing any of its volume through evaporation. This cannot be done with gasoline.

The Electric System

Wiring of Haynes 37

Q—Publish wiring diagram of Haynes light six model 37.—J. Elzel, Vallejo, Cal.

The Haynes 37 wiring diagram is shown in Fig. 11.

Case for Authorized Agent

Q—On the 1919 Maxwell touring car the present charging system has a cut-out relay and no regulating relay. What is the theory of the regulation of the generator output and how can the output be increased? When the engine is cold the ammeter indicates a flow of approximately 15 to 20 amp., which slowly decreases as

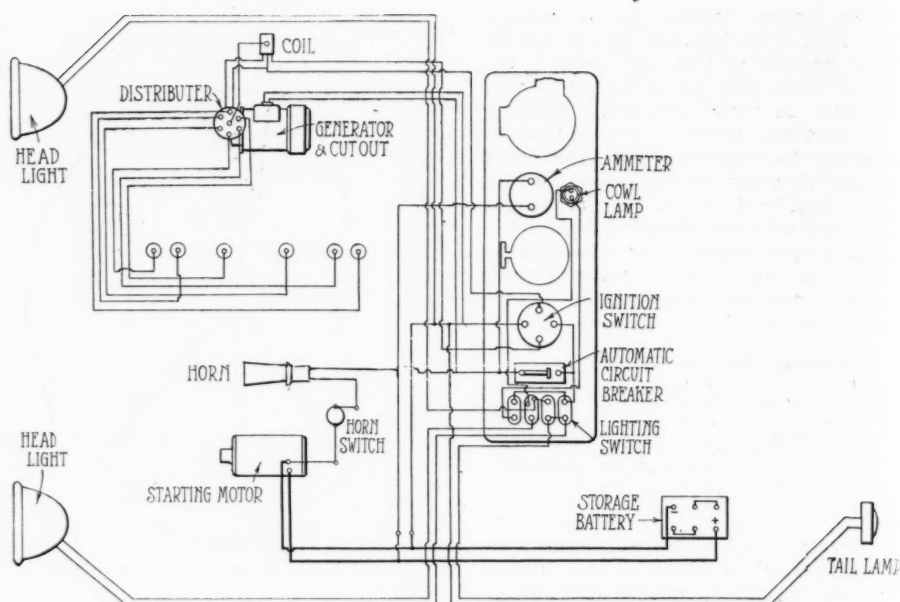


Fig. 11—Wiring diagram of the Haynes 37

the charge progresses, and after about 10 min. of running, approximately only 3 amp. are flowing to the battery.—B. J. Kirchner, Riverside, Ill.

According to the specifications concerning the electrical equipment of the Maxwell 1919 models, your car is equipped with a Simms-Huff system, and the generator has a regulator. The reg-

ulator is of the type that controls the current which flows through the field coils and thus controls the voltage of the generator. The location of the cut-out and the regulator is on the dashboard. Just what the difficulty with the regulation is on your car is rather hard to say. There is so little information to

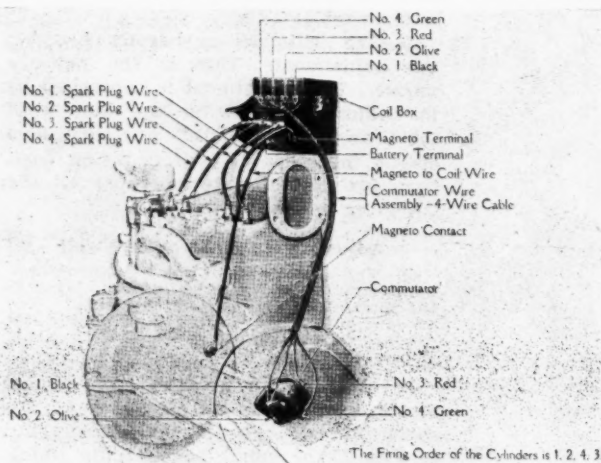


Fig. 10—Wiring diagram of Fordson tractor

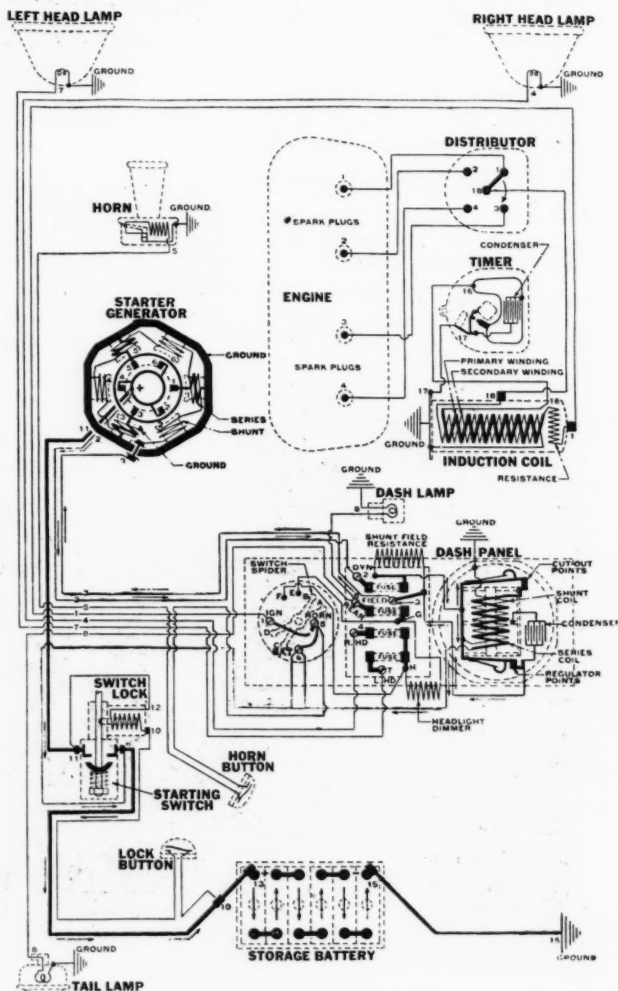


Fig. 12—Wiring diagram of Simms-Huff system on Maxwell

work with. A condition which would cause similar operation would be to have the condenser connections loose.

The condenser is shown in the circuit diagram, Fig. 12, connected across the regulator points. With the condenser connections loose or burnt out, the regulator contact points would become extremely hot in a short time, causing very poor contact to be made and thus keeping the shunt field resistance in the circuit almost continuously. At any rate this is a task for the authorized Simms-Huff agent to handle, for if the contacts of the system are tampered with by any one not an authorized agent, the manufacturer's guarantee then becomes void.

Ignition System on Hudson

Q—In your issue of May 29 you show sketch of wiring a Bosch dual ignition system. I have the same system on a Hudson 33, 1912, but only used the magneto, and in trying to wire same with battery find that the coil has only three binding posts. Publish wiring diagram.—William C. Hogel, Chillicothe, Mo.

The diagram as used by the Hudson company for this model car is shown in Fig. 14.

Electric System on Fordson

Q—Give wiring diagram of Fordson tractor.

2—Illustrate and explain the air cleaner on Fordson.

3—Could an electric light be run from magneto of a Fordson?

4—Does Bosch or another magneto run at crankshaft speed.—Fred Harlin, Itasca, Tex.

1—The Fordson wiring diagram is illustrated in Fig. 10.

2—The air washer on the Fordson is of the wet type, that is, the air is drawn through a bath of water, and the water removes the dust particles from the air before it reaches the carburetor. The air cleaner of the wet type really serves two purposes, that of removing the dust primarily and that of moistening the charge. The air enters at the center of the washer and at the bottom. Here it is drawn up through a guide chamber. At the top of the guide chamber the air is deflected and turned through an angle of 180 deg., bringing it downward through the bath of water. The air, being drawn through the water in minute bubble form, has the dust readily removed from it.

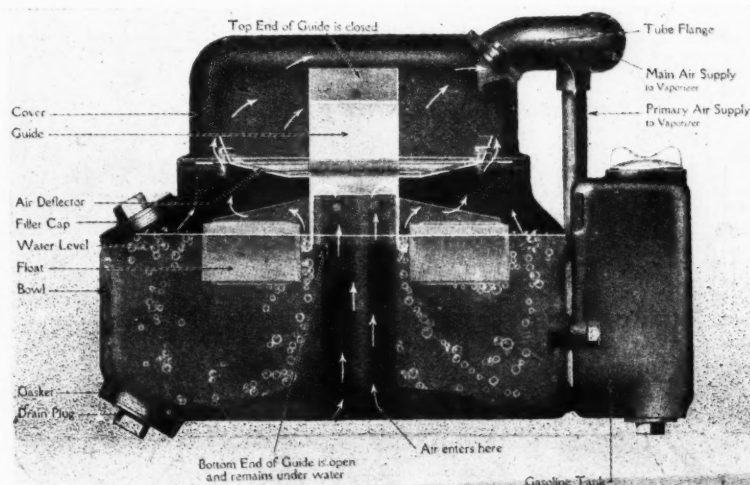


Fig. 13—Air washer used on the Fordson tractor

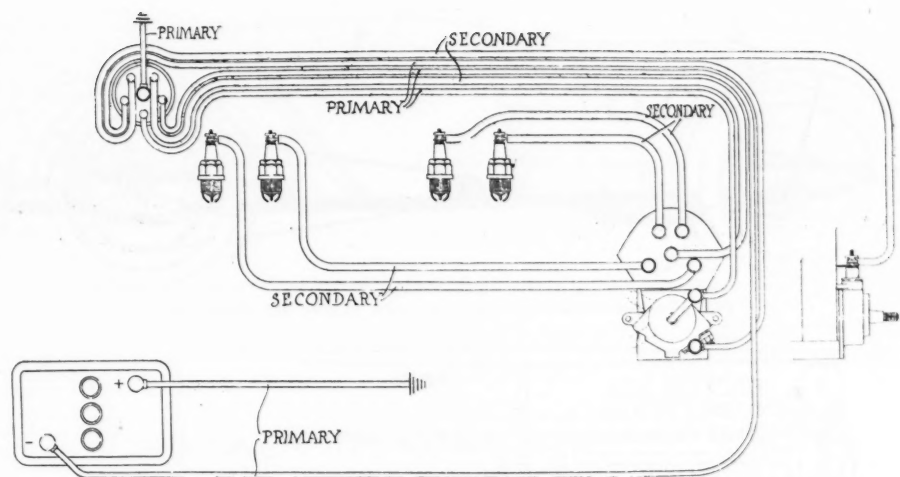


Fig. 14—Wiring diagram of Bosch dual ignition system

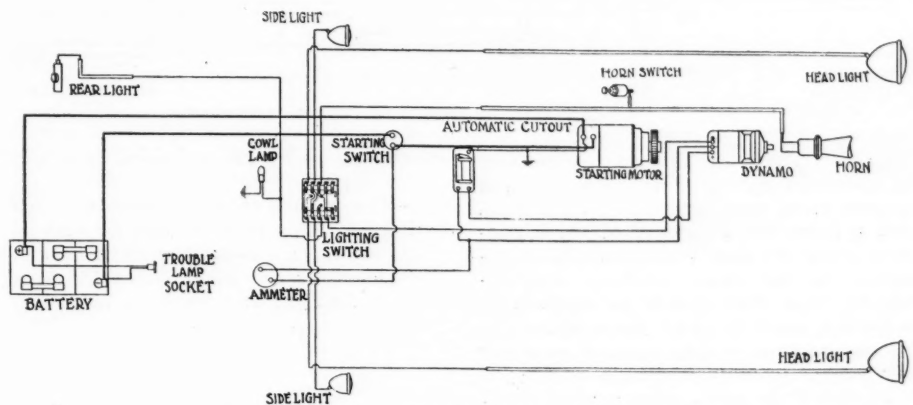


Fig. 15—Wiring diagram of the Velie for 1914

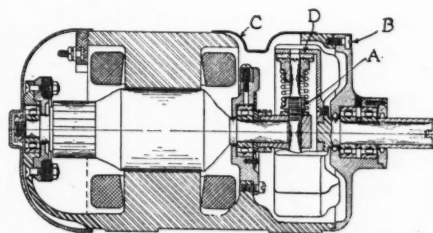


Fig. 16—Cross-section of Gray & Davis generator

3—Yes, the Fordson tractor magneto is very similar in this respect to the Ford car. The voltage produced is of the alternating current type and increases in pressure as the engine speed increases.

4—As the revolutions of the armature of the magnetic always bears a fixed relation to those of the crankshaft of the engine, it will be apparent that the speed at which the magneto is driven will depend on the number of cylinders to be fired, as well as the relation of the cylinders to one another, that is, the angular relation depending upon whether the firing occurs 180 deg. or 360 deg. apart. The following are the various magneto speeds required for engines of the four-cycle type having from one to twelve cylinders: One-cylinder, crankshaft or camshaft speed; two-cylinder—impulses alternately 360 deg. apart, as in two-cylinder opposed engine—camshaft speed; two-cylinder—impulses alternately at 180 deg. with 540 deg. intervals as in the V-type engine—camshaft speed; three-cylinder, three-fourths crankshaft speed; four-cylinder, crankshaft speed; six-cylinder, one and a half crankshaft speed; eight-cylinder, twice crankshaft speed; twelve-cylinder, three times crankshaft speed.

Wiring of 1914 Velie

Q—Publish instructions to wire a four-cylinder 1914 Velie, model R.—Carl B. Zimmerman, Alliance, Ohio.

The diagram for this car is shown in

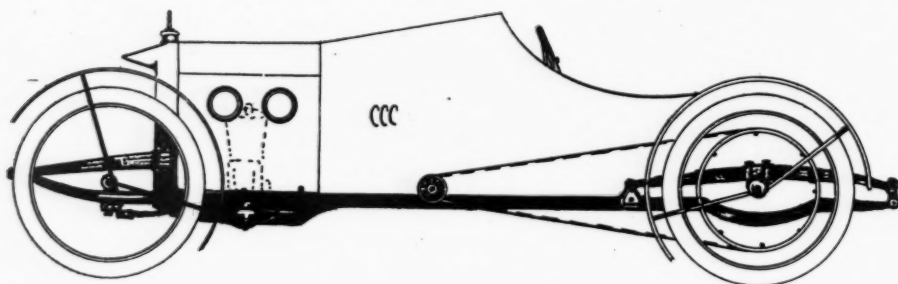


Fig. 17—Suggestion for cyclecar with engine set crosswise

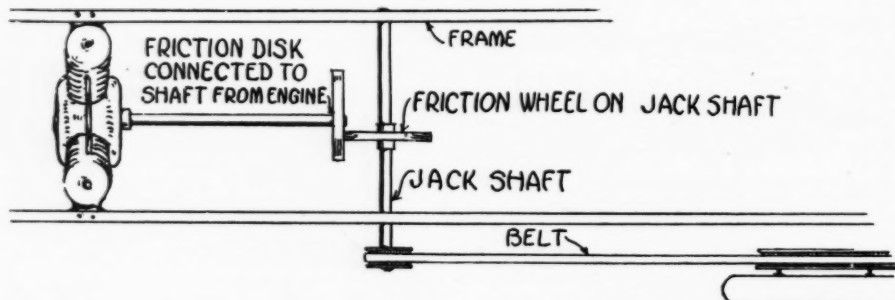


Fig. 18—Layout for same cyclecar with friction transmission

Fig. 15. There are no set instructions to follow in wiring a car. Be sure that all the wires used have heavy insulation, and if there are a number of wires running along the side of the car, all terminating in the same position approximately, then they should be inclosed in a flexible conduit. Any place where the wires lead from a rigid member to member subject to vibration flexible stranded wire should be used. Heavy wire, about the equivalent in area of No. 0 or 00 B. & S. gage, should be used for starting motors.

To Increase Charging Rate

Q—How can the charging of a generator of an Overland 79, 1914, be increased. It has to be run 30 m.p.h. to get 8 amp. charge. At 15 m.p.h. there is about 3 amp. The commutator was turned and new field coils and new brushes installed but no results.—M. E. Enochs, Coalgate, Okla.

The current on the generator of the Gray & Davis 1914 system as used on the Overland 79 of 1914 is controlled by a frictional governor. The cross-section of the generator is shown in Fig. 16. When the generator left the factory the governor was adjusted so that the speed of the generator would not vary from 1000 r.p.m. If it is desired to increase the charging rate, the tension of the spring on the governor must be increased. It is possible that the friction facing is worn.

Charging Magnets

Q—Would a D. C. generator such as used on a motor car do to charge magnets if run at high enough speed? If so, explain how this is done.

2—In assembling a magneto, how can one tell which is the north pole and which is the south. I have placed the magnets so they repel each other, but the machine turns clockwise and I do not understand whether to place the north pole on the right side of the machine or the south pole on the right side. Which is correct?

3—When charging a magneto that has extra field magnets, do the extra magnets on the outside have to be charged and placed back the same as the others?

4—A magneto is said to raise its voltage several thousand times after going through the secondary winding and it has 6 volts to start with. If this is true, why doesn't a person get killed by touching a

spark plug lead while the engine is in motion?—Frank Milligan, Joplin, Mo.

1—The voltage from the generator can be used for this purpose just as well as if it were from a battery or light source. The generator should be connected to a magnet charger, and we have described

several of these in recent issues, May 15 being one of them.

2—There will be no practical difference in the placing of the magnets, whether they are on the right side or the left side.

3—The outside magnets must be placed the same as the inside magnets. Where two poles come together on the same side of the armature shaft these two poles must be of the same polarity.

4—It is estimated that at least 1/14 amp. is necessary to kill an ordinary human being. The amperage from a magneto is at best only 0.001 or 0.002 amp., and this amount of current is hardly enough to kill anyone.

Magneto on Three-Cylinder

Q—Publish information as to the mounting of a magneto on a marine engine, Wolverine three-cylinder four-cycle engine, make and break ignition, 50 hp., 300 r.p.m., magneto to be installed, Bosch type A.R.H., same as used on old Premier 30, tried driving this magneto with a belt but find that it must be in time with plugs or it misses. Give best method of driving, chain or gear.—R. Driscoll, Driscoll, Tex.

We do not see how you can use this magneto on the three-cylinder engine you have. The reason is seen in the rotative speeds of the magneto and the angular relation between the sparks as produced by the magneto and the timing requirements of a three-cylinder engine. The magneto produces two sparks per revolution, while the engine requires one and a half sparks per revolution, or

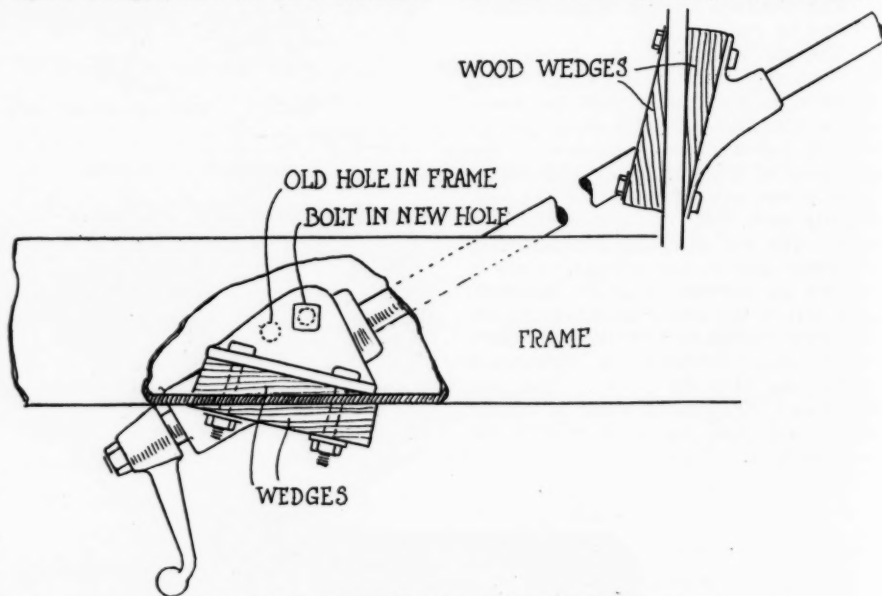


Fig. 19—How to lower the Ford steering gear

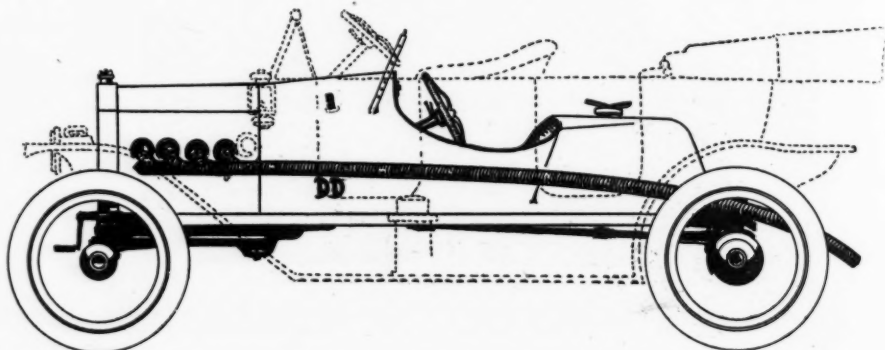


Fig. 20—Suggestion for inexpensive speedster body for Ford

three sparks per two revolutions. The fact that the Bosch A. R. H. is a low-tension machine does alter the conditions, for the relation between the timing of the sparks would still be the same.

No Contact at High Speed

Q—What makes the ammeter on a Buick show charge at slow speed and then go back to nothing at high speed?—Andrew Adie, Gothenburg, Neb.

Had you told us the model we would have felt much more certain in answering. Some cars using the Delco system several years ago experienced the same difficulty when an excessive amount of oil was fed into the generator ball bearings at the distributor end. The oil leaked out through the ball retainer and onto the commutator, causing the third brush to become clogged and refuse to function. This difficulty can be overcome by installing the oil-throwing collar furnished by the Dayton Engineering Laboratories, Dayton, Ohio. If the Delco system is of a late date, then this difficulty will not be experienced, and the trouble which you are having might be caused by a loose brush or a badly worn one. The commutator might be worn and the mica between the segments high. In that case the brush would not make contact at high speeds.

Rebuilding

Belt Driven Cyclecar

Q—Give specifications and illustrate a cyclecar with engine set crosswise in frame, with friction transmission, with belts running from jackshaft to drive wheels and using motorcycle wheels.—Fred Harlin, Itasca, Tex.

The design in Figs. 17 and 18 illustrates a cyclecar with friction transmission and belt drive.

Getting Speed By Design

Q—Publish a snappy four-passenger closed model design for Ford, having a low windshield similar to the racer design for the Dodge in the issue of Feb. 13.

2—Could four speeds ahead and one reverse be put on the Ford? Where can I get same?

3—Would you suggest counterbalances in engine?

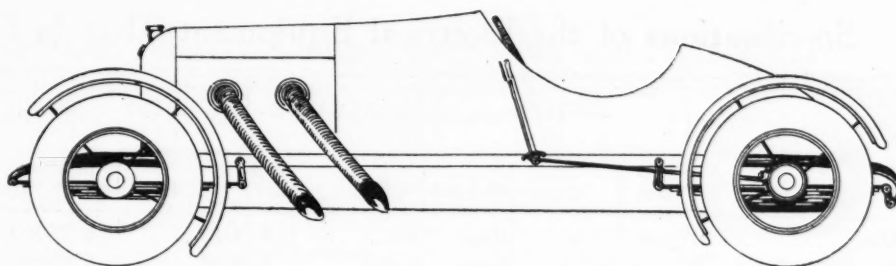


Fig. 22—Suggestion for miniature car such as is raced in California

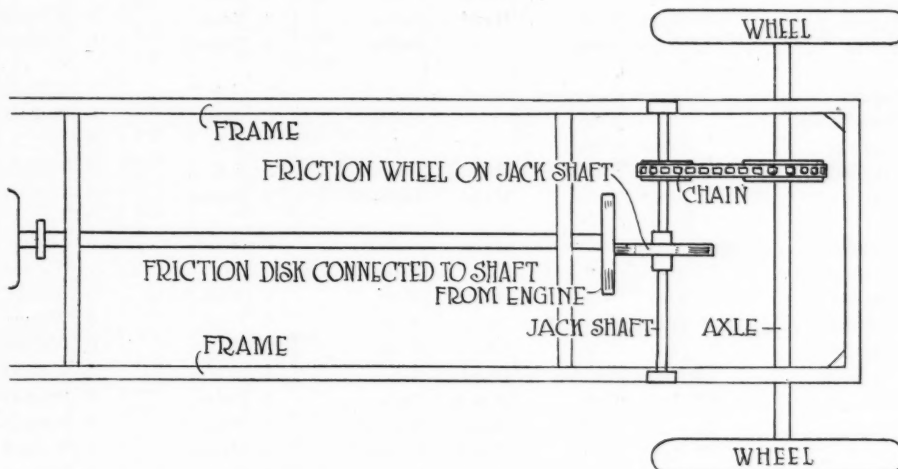


Fig. 23—Layout for same car with chain drive which is advised

4—Could the Ford be underslung and suspended in the rear like the new Mitchell Victory model?—H. L. Bock, Hanford, Cal.

1—This design is shown in Fig. 21.

2—Auxiliary transmission gears for Fords are made by the Western Truck Attachment Co., 1510 Eleventh avenue, Seattle, Wash., and the Tractor-Train Co., 1346 South Wall street, Los Angeles, Cal.

3—Counterbalances such as made by the Dunn company help to reduce the vibration of the engine considerably.

4—The new Mitchell Victory model has a cantilever spring suspension. To duplicate this construction on your Ford would be extremely difficult because the frame must be widened and probably off-

set at the rear end. Special spring shackles must be made to accommodate the cantilever spring, and if the spring is to be of the Mitchell type you will have to have a special rear axle connection made. Fig. 21 shows a spring arrangement scheme such as used on the Mitchell with its double connection at the rear axle.

Inexpensive Speedster

Q—Show sketch of 1914 Ford touring car converted into an inexpensive speedster using buck seats and having the passenger's seat at an offset. I do not want to underslung it, will use same radiator and hood, no fenders and desire to have exhaust at the side.

2—Show method of lowering steering wheel.
3—The car has $3\frac{1}{2}$ by 30-in. tires on rear and 3 by 30-in on front. I wish to use $3\frac{1}{2}$ by 30-in. all around. Should the speedometer gears be changed, and to what size to have correct reading?—Mark Hynes, Indianapolis, Ind.

1—The car is illustrated in Fig. 20.

2—This is illustrated in Fig. 19.

3—Leave the speedometer gears as they are. The slight difference caused by changing from 30 by 3 in. tires to 30 by $3\frac{1}{2}$ in. tires will hardly be noticeable.

Plans for Miniature Car

Q—In the May 22 issue of Motor Age, page 33, you give picture of miniature car such as are used on the Vernon California racetrack by boys. Give me plans and probable cost of construction of similar car and plan to use a two-cylinder Harley-Davidson engine, developing about 1 to 20 hp. regulation tread and 100 or 110 in. wheelbase.

2—Which would be best, a chain or friction drive?—D. C. Bugbee, West Branch, Iowa.

1—The construction of this car is illustrated in Figs. 22 and 23. If it is possible for you to do the work yourself, the total cost should be within \$600.

2—We advise that you use chain drive, as it is direct and positive.

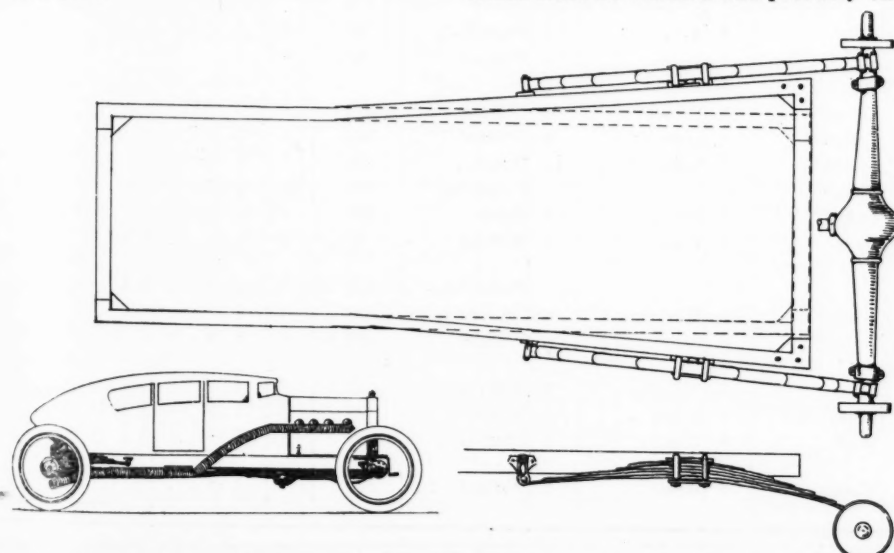


Fig. 21—Suggestion for four-passenger closed Ford, with changes in chassis necessary for cantilever springs

Specifications of the Electrical Equipment That Is Found on 1919 Passenger Cars

Make and Model	IGNITION			GENERATOR		MOTOR		BATTERY			Wiring-System	Type of Electric System	FUSES		
	System	Make	Control	Make	Volt age	Make	Volt age	Make	Amp. Hr.	Volt age			Type	Volts	Amp
Allen.....41	Single	Conn.	Hand	A-L.	6	A-L.	6	U. S. L.	90	6	1	GI.	GT.	5	15
American.....B	Single	At-Kent.	Hand	West.	6	West.	6	Columbia.	80	6	1	S.	3-A.	1.250	20
Anderson.....All	Single	Conn.	Hand	West.	6	West.	6	Willard.		6	1	S.	SAE.	6	5
Apperson.....8-19	Single	Remy.	Hand	Bijur.	6	Bijur.	6-8	Willard.	90	6	1	S.	Open.	1.250	10
Auburn.....6-39	Single	Remy.	Hand	Remy.	6	Remy.	6	Willard.	80	6	1	S.		6-8	25
Austin.....12	Single	Delco.		Delco.	6	Delco.	6	Willard.		6	1	S.	None.		
Biddle.....H	Single	Eisemann.	Hand	G & D.	6	G & D.	6	Willard.	90	6	1	S.	GT.	6	10
Bour-Davis.....		Remy.		Remy.	6	Remy.	6	Willard.	115	6	1			6	15
Brewster.....	Single	Conn.		A-L.	6	A-L.	6								
Briscoe.....4-24	Single	Conn.	Hand	A-L.	6	A-L.	6	U. S. L.	80	6	1	GI.	GT.	6	15
Buick.....	Single	Delco.	Hand	Delco.	6	Delco.	6	U. S. L.	80	6	1	S.			
Cadillac.....57	Single	Delco.	Hand	Delco.	6	Delco.	6	Exide.		6					
Campbell.....C-4	Single	At-Kent.		A-L.				Willard.			1				
Case.....U-19	Single	West.	Hand	West.	6	West.	6	Willard.	117½	6	1	GI.	3AGT.	50	15
Chalmers.....35C	Single	Bosch-Rem	Hand	West.	6	West.	6	Willard.	93		1				
Chandler.....	Single	Bosch.	Hand	West.	6	West.	6	Willard.	100	6	1	S.	Cart.	6	20
Chevrolet.....All	Single	Remy.	Hand	A-L.	6	A-L.	6	Willard.	80	6	1	GI.	GT.	6	20
Cole.....870	Dual	Delco.	H & A.	Delco.	6	Delco.	6	Prest-O-L.	50	6	1	S.			
Columbia.....All	Single	At-Kent.	Hand	Ward-L.	6	Ward-L.	6	Prest-O-L.	80	6	1	S.			
Comet.....C-51	Single	Delco.	H & A.	Dyneto.	6	Dyneto.	6	Willard.	75	6					
Crow-Elkhart.....K-36	Single	Conn.	Hand	Dyneto.	6	Dyneto.	6	Willard.		6					
Cunningham.....V-3	Single	Delco.	Hand	West.	6	West.	6	Willard.	120		1				
Daniels.....8-B	Single	West.	Hand	West.	6	West.	6	Willard.	100		1	S.	GT.	5-8	15
Davis.....		Bosch.		West.	6	West.	6	Willard.							
Dixie Flyer.....	Single	Conn.	Hand	Dyneto.	6	Dyneto.	6	Willard.	6-60		2				
Dodge.....	Single		H & A.	N. E.	12	North East.		Willard.		12	1	GM.	Encl.	1-50	10
Dorris.....	Single		Hand	West.	6	West.		Willard.	115	6	1	S.	GT.	5-8	15
Dort.....15	Single	Conn.	Hand	West.	6	West.	6	Willard.	85	6	1	S.		6	10
Elcar.....All	Single	At-Kent.	Hand	Dyneto.	7	Dyneto.	6	Willard.	90	6	1				
Elgin.....H	Single	Wagner.	Hand					Willard.	90		1				
Essex.....A	Single	Delco.	H & A.	Delco.	7	Delco.	6		105	6	1	S.			
Ford.....T*	Single	Own.	Hand	Own.		Own.		Exide.	30	6	1	S.			
Franklin.....9	Single	At-Kent.	Auto.	Dyneto.	12			Willard.	50	12		GM.	GT.	122	15
Geronimo.....		Delco.		Dyneto.	6	Dyneto.	6	Willard.	88	6	1	S.			
Glide.....6-40		West.		West.	6	West.	6	Willard.	80	6	1	GI.	Cart.	250	15
Hanson.....45-A		Remy.	Hand	A-L.	6	A-L.	6	Prest-O-L.	80	6	1			6	3
Harroun.....	Single	At-Kent.	Hand	Remy.	6	Remy.	6	Willard.	80	6	1				
Harvard.....4-20		At-Kent.		Wagner.	6	Wagner.	6	Nat. Carb.			1	S.			
Hatfield.....A		Conn.		Dyneto.	6	Dyneto.	6	Willard.	100	6	1	GI.			
Haynes.....All	Single	Delco.	Auto.	Leece-N.	6	Leece-N.	6	Willard.	120	6	2	GI.	C. B.		
Hollier.....All	Single	At-Kent.	Hand	Splitdorf.	6	Splitdorf.	12	Gould.	50	6	1	GM.			
Holmes.....	Single	Eisemann.	Auto.	Dyneto.	12			Columbia.	100	12	2	S.	2A.	15	15
Hudson Super-Six.....	Dual	Delco.	Hand	Delco.	7	Delco.	7	Exide.	100	6	1	GM.			
Hupmobile.....R	Single	At-Kent.	Hand	West.	7	West.	7	Willard.	87½	6	1	S.	Encl.	6	10
Jackson.....	Single	Remy.	S-A.					Prest-O-L.	120	6	2	S.	3 A.	6-8	20
Jones.....	Single	Remy.	Hand	West.	6	West.	6	Prest-O-L.	120	6	1				
Jordan.....	Single	Delco.	H & A.	Bijur.	6	Bijur.	6	Willard.	109.8	6	1	S.	C. B.		
King.....EE-8	Single	At-Kent.	H & A.	Bijur.	6	Bijur.	6	Willard.	117.5	6	1				
Kissel.....	Single	Remy.	Hand	Remy.	6	Remy.	6	Willard.	90	6	1	S.	3 A. G.		20
Kline.....642-S8	Single	Conn.	Hand	West.	6	West.	6	Prest-O-L.	80	6	1	S.	5 A. G.	6	
Lexington.....R-19	Single	Conn.	Hand	West.	6	West.	6	Willard.	100	6	1	S.	G. T.	6	

ABBREVIATIONS: *Starting and Lighting in closed models only. Ignition: At-K, Atwater-Kent; Conn., Connecticut; West, Westinghouse; Auto, Automatic; H & A, Hand and Automatic; S. A., Semi-Automatic. Generator: A-L, Auto-Lite; G & D, Gray & Davis; Leece-N, Leece-Neville; Ward-L, Ward-Leonard; West, Westinghouse; N. E., North East; Split, Splitdorf. Motor: A-L, Auto-Lite, G & D, Gray & Davis; Leece-N, Leece-Neville; West, Westinghouse.

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Battery
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Giving Ignition, Starting, Lighting, Battery, Lamp, Spark Plug and Horn Data

Base Contact	LAMP CANDLEPOWER, VOLTAGE AND TYPE OF BASE								SPARK PLUGS			Horn	Make and Model
	HEADLIGHTS		SIDELIGHTS		TAILLIGHTS		DASHLIGHT		Make	Diam. Inches	Thread Pitch		
	Volts	CP.	Volts	CP.	Volts	CP.	Volts	CP.					
Single.....	6-8	15	*6-8	4	6-8	2	6-8	2	Champion.....	7/8	18	Garford.....	Allen.....41
Single.....	6-8	15	*6-8	4	3-4	2	d6-8	2	.....	7/8	18	Sparton.....	American.....B
Single.....	6-8	21	6-8	4	6-8	4	6-8	4	A. C.	7/8	18	Klaxon.....	Anderson.....All
Double.....	6-8	15	*6-8	4	d6-8	2	d6-8	2	A. C.	7/8	18	Sparton.....	Apperson.....8-19
Single.....	6-8	15	*6-8	4	6-8	2	6-8	2	Rajah.....	7/8	18	E. A.	Auburn.....6-39
Single.....	6-8	21	6-8	4	6-8	4	6-8	2	Reflex.....	7/8	18	Sparton.....	Austin.....12
Single.....	6-8	21	*6-8	4	6-8	2	d6-8	2	Splitdorf...	7/8	18	Klaxon.....	Biddle.....H
.....	6-8	15	6-8	4	6-8	2	6-8	2	Champion.....	7/8	18	E. A.	Bour-Davis.....
Single.....	12-16	21	6-8	4	6-8	2	d6-8	2	Herz-Boug.	7/8	18	Klaxon.....	Brewster.....
Single.....	6-8	21	.....	.....	6-8	2	d6-8	2	Champion.....	7/8	.....	Schwarze..	Briscoe.....4-24
Single.....	6-8	15	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Stewart...	Buick.....
.....	6-8	21	6-8	4	3-4	2	3-4	2	Titan.....	.....	.....	Auto-horn.	Cadillac.....57
.....	.....	.....	.....	.....	.....	.....	.....	.....	A. C. ....	.....	.....	Garford...	Campbell.....C-4
Single.....	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8	.....	Klaxon...	Case.....U-19
Single.....	6-8	21	6-8	4	6-8	2	6-8	2	A. C.	7/8	.....	Sparton...	Chalmers.....35-C
Single.....	6-8	15	6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Trojan...	Chandler.....
Single.....	6-8	21	6-8	4	6-8	2	d6-8	4	A. C.	7/8	18	Klaxon...	Chevrolet.....All
Single.....	6-8	21	*6-8	12	6-8	2	d6-8	4	A. C.	7/8	18	Sparton...	Cole.....870
Single.....	6-8	15	*6-8	4	6-8	2	d6-8	2	Champion.....	7/8	18	Schwarze..	Columbia.....All
Single.....	6-8	.....	3-4	.....	3-4	.....	3-4	.....	Champion.....	7/8	18	Trojan...	Comet.....C-51
Single.....	6-8	15	6-8	4	6-8	2	6-8	2	Champion.....	7/8	.....	E. A. Lab..	Crow-Elkhart...K-36
Single.....	6-8	21	6-8	4	6-8	2	6-8	2	Champion.....	7/8	.....	Sparton...	Cunningham...V-3
Single.....	6-8	21	6-8	4	6-8	2	d6-8	2	A. C.	5/8	18	Klaxon...	Daniels.....8-B
Single.....	6-8	21	.....	.....	6-8	2	6-8	2	A. C.	7/8	.....	Klaxon...	Davis.....
Double.....	6-8	15	.....	.....	d3-4	2	d3-4	2	Champion.....	.....	.....	Garford...	Dixie Flyer.....
Single.....	12-16	15	.....	.....	12-16	2	12-16	2	A. C.	7/8	18	Klaxon...	Dodge.....
Single.....	6-8	21	*6-8	4	6-8	2	6-8	2	Champion.....	7/8	18	Klaxon...	Dorris.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	A. C. ....	.....	.....	.....	.....
Single.....	6-8	15	.....	.....	6-8	2	d6-8	2	A. C.	7/8	18	Schwarze..	Dort.....15
Single.....	6-8	15	6-8	4	6-8	2	6-8	2	Champion.....	.....	.....	Klaxon...	Elcar.....All
Single.....	6-8	21	.....	.....	6-8	2	6-8	2	Champion.....	7/8	18	E. A. L. ...	Elgin.....H
Single.....	6-8	15	.....	.....	3-4	2	*3-4	2	A. C.	18 m.m.	1.5 m.m.	Sparton...	Essex.....A
Single.....	6-8	21	6-8	2	6-8	2	.....	.....	Champion.....	1/2	pipe	Own.....	Ford.....T
Double.....	12-16	21	*12-16	4	6-8	2	6-8	2	Splitdorf...	7/8	18	Klaxon...	Franklin.....9
.....	.....	.....	.....	.....	.....	.....	.....	.....	Benton.....	.....	.....	Trojan...	Geronimo.....
Single.....	6-8	21	.....	.....	6-8	2	6-8	2	Champion.....	7/8	18	Klaxon...	Glide.....6-40
Single.....	6-8	15	*6-8	4	d6-8	2	d6-8	2	Champion.....	7/8	18	Schwarze..	Hanson.....45-A
.....	6-8	15	.....	.....	6-8	2	6-8	2	Champion.....	7/8	18	Schwarze..	Harroun.....
Single.....	6-8	.....	3-4	.....	3-4	.....	*3-4	.....	.....	7/8	18	.....	Harvard.....4-20
Single.....	6-8	15	*4-8	4	6-8	4	6-8	2	A. C.	7/8	18	Ecco.....	Hatfield.....A
Double.....	6-8	15	*6-8	12	d6-8	2	6-8	2	A. C.	7/8	18	Klaxon...	Haynes.....All
Single.....	6-8	15	.....	.....	6-8	2	6-8	2	Champion.....	7/8	18	Sparton...	Hollier.....All
Double.....	12-18	30	*12-16	4	6-8	2	6-8	2	Bethlehem	7/8	18	Klaxon...	Holmes.....
Single.....	6-8	15	6-8	4	3-4	2	*3-4	2	A. C.	7/8	18	Sparton...	Hudson Super Six.....
Single.....	6-8	15	6-8	2	6-8	2	6-8	2	A. C.	7/8	18	Trojan...	Hupmobile.....R
.....	.....	.....	.....	.....	.....	.....	.....	.....	A. C. ....	.....	.....	.....	Jackson.....
Double.....	6-8	15	*6-8	4	s6-8	2	s6-8	2	Champion.....	7/8	18	Newtone..	Jones.....
Single.....	6-8	21	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Sparton...	Jordan.....
Single.....	6-8	21	*6-8	4	6-8	2	6-8	2	Champion.....	7/8	18	E. A. L. ...	King.....EE-8
Double.....	6-8	18	.....	.....	d6-8	2	d6-8	2	A. C.	7/8	18	Sparton...	Kissel.....
Single.....	6-8	15	.....	.....	6-8	2	d6-8	2	Champion.....	7/8	18	Klaxon...	Kline.....642 S. 8
Single.....	6-8	21	*6-8	4	6-8	2	d6-8	2	Champion.....	7/8	18	Klaxon...	Lexington.....R-19
.....	.....	.....	.....	.....	.....	.....	.....	.....	Bethlehem	.....	.....	.....	.....

Battery: *Prest-O-Lite*, *Prest-O-Lite*. Wiring system: *GI*, Generator and Ignition combined; *GIM*, Generator, Ignition, Motor combined; *S*, Generator, Motor, Ignition separate; *GM*, Generator and Motor combined. Fuses: *GT*, Glass Tube; *Car*, Cartridge; *C. R.*, Circuit Breaker. Lamps: *Dashlights in series with taillights; headlight contains sidelight; d,—double contact; s,—single contact.

Specifications of the Electrical Equipment That Is Found on 1919 Passenger Cars

Make and Model	IGNITION			GENERATOR		MOTOR		BATTERY		Wiring System	Type of Electric System	FUSES		
	System	Make	Control	Make	Voltage	Make	Voltage	Make	Amp. Hr.			Type	Voltage	Amp.
Liberty.....10B	Dual	Delco.	Hand	Delco.	6	Delco.	6	Willard.	88	6	1	GI.		
Locomobile.....38-2	Dual	Berling.	Hand	West.	6	West.	6	Willard.	120	6	1	S.	G. T.	6 10
Maibohm.....B	Single	At-Kent.	Hand	Wagner.	6	Wagner.	6	Willard.	80	6	1	S.	A. L.	6 30
Marmon.....34	Single	Bosch.	Hand	Bijur.	6	Bijur.	6	Prest-O-L.	120	6	1	S.	Cart.	20
Maxwell.....25	Single	Hand.	Hand	Simms-Huff.	12	Simms-Huff.	12	Prest-O-L.	35	12	1	GM.	Cart.	12 20
McFarlan.....127	Double	Bosch.	Hand	West.	6	West.	6	Willard.	5 Amp. 27.8 h. p.	6	1	GI.	5 A. G.	6
Mercer.....Ser. 4	Single	Berling.	Hand	Remy.	6	Remy.	6	Willard.	90	6	1	S.	Cart.	10
Mitchell.....E-40	Single	Remy.	Hand	Remy.	6	Remy.	6	Willard.	100	6	2	GM.	Cart.	6 20
Moline Knight.....L	Dual	Conn.	Hand	Wagner.	6	Auto-Lite.	6	Willard.	117	6	1	S.	Cart.	250 20
Monitor.....	Single	Hand.	Hand	Dyneto.	6	Dyneto.		Willard.	88	6	1			
Moon.....All	Single	Delco.	Auto.	Wagner.	6	Wagner.	6	Exide.	80	6	1			
Moore.....30	Single	Conn.	Hand	A-L.	6	A-L.	6	Willard.	80	6	2			
Nash.....	Single	Delco.	H & A.	Delco.	6	Delco.	6	Willard.	100	6	1	S.		
National.....6	Single	Delco.	H & A.	West.	6	West.	6	Prest-O-L.	110	6	1	S.	G.	5
National.....12	Single	Delco.	H & A.	Bijur.	6	Bijur.	6	Prest-O-L.	110	6	1	S.	G.	10
Nelson.....		Bosch.	Hand	U. S. L.	12	U. S. L.	12	Willard.	72	12	2	S.	G.	12
Oakland.....34-B	Single		Hand.	Remy.	6	Remy.	6	Prest-O-L.	85	6	1	GI.		
Oldsmobile.....All	Single	Remy.	Hand	Delco.	6	Delco.	6	U. S. L.	80	6	1			
Olympian.....45	Single	Conn.	Hand	A-L.	6	A-L.	6	U. S. L.		6				
Overland.....90	Single	Conn.	Hand	A-L.	6-8	A-L.	6	U. S. L.	75	6-8		GI.	Glass.	6 20
Packard.....3-25	Single	Delco.	H & A.	Bijur.	6	Bijur.	6	Willard.	120	6	1	S.	G. T.	6 10
Paige.....All	Single	Remy.	Hand	Gray & Davis	6	Gray & Davis	6	Willard.	108.4	6	1	S.	G.	20
Pan-American.....6-48	Single	At-Kent.	Hand	West.	6	West.	6	Willard.	101	6	1	S.	G.	
Paterson.....6-46	Dual	Delco.	Hand	Delco.	6	Delco.	6	Willard.		6	1			
Peerless.....Ser. 4	Single	At-Kent.	H & A.	A-L.	6	A-L.	6	Willard.		6	1			
Pierce-Arrow.....B-5	Double	Bosch.	Hand	West.	6-8	West.	6	Exide-Willard	135	6	1		5 A. G.	6-8 10
Pilot.....6-45	Dual	Delco.	Hand	Delco.	6	Delco.	6	Prest-O-L.		6	1	GI.		
Premier.....6-C	Single	Delco.	Hand	Delco.	6	Delco.	6	Willard.	123.5	6	1	S.		
Reo.....T & U	Single	Remy.	Hand	Remy.	6	Remy.	6	Willard.	108.5	6	2	GI.	Wire.	6 5
Revere.....	Single	Bosch.	Hand	North East	6	North East	6	Willard.	120	6	1	S.		
Roamer.....6-54	Single	Bosch.	Hand	Bijur.	6	Bijur.	6	Willard.	115	6	1	S.	3A.	6 10
Saxon.....Y-16	Single	Remy.	Hand	Wagner.	6	Wagner.	6	Prest-O-L.	60	6	1	S.	Cart.	6-8 15
Sayers.....	Single	Delco.	Hand	Delco.	6	Delco.	6	Willard.		6	1			
Scripps-Booth.....	Single	Remy.	Hand	Remy.		Remy.	6	Prest-O-L.	80	6	1			
Seneca.....H	Single		Hand	Allis Chalm.	6			Willard.	88	6	1	GM.		20
Singer.....19	Single	Bosch.	Hand	West.	6	West.	6	Willard.	115	6	1	S.	G. C.	5a10
Standard.....8 G	Single	Split.	Hand	West.	6	West.	6	Willard.	160	6	1			
Stanley.....735				Remy.	6			Willard.	100	6	1	G.	Cart.	6 20
Stearns.....SKL-4	Single	Remy.	Hand	Remy.	12	Remy.	12	Willard.	61.5	12	1	S.		20
Stephens.....80	Single	A-L.	Hand	A. L.	6	A. L.	6	U. S. L.	116	6	1	S.		
Studebaker.....EH	Single	Remy.	Hand	Wagner.	6-8	Wagner.	6	Willard.	80	6	1	S.	Cart.	6 10
Stutz.....G	Double		Hand	Remy.	6	Remy.	6	Willard.		12	2			
Templar.....445	Single	Remy.	H & A.	Remy.	6-8	Remy.	6	Columbia.	100		1			
Tulsa.....A-D-1	Single	Delco.	Hand	Dyneto.	6	Dyneto.	6	Willard.	90	6	1	S.	G. T.	6 15
Velie.....38	Single	Remy.	Auto.	Remy.	6	Remy.	6	Willard.	105	6	1	S.	Wire.	6 5
Westcott.....	Single	Delco.	H & A.	Delco.	6	Delco.	6	Willard.	109.8	6	1	S.	C. B.	7 25
Willys-Knight.....88-4	Single	Conn.	Hand	A-L.	6-8	A-L.	6	U. S. L.	120	6	2	GI.	G. T.	6 20
Winton Six.....All	Single	Bosch.	Hand	Bijur.	6	Bijur.	6	Willard.	110	6	1	S.	3A.	6 20

ABBREVIATIONS: *Starting and Lighting in closed models only. Ignition: At-K, Atwater-Kent; Conn., Connecticut; West, Westinghouse; Auto, Automatic; H & A, Hand and Automatic; S. A., Semi-Automatic. Generator: A-L, Auto-Lite; G & D, Gray & Davis; Leece-N, Leece-Neville; Ward-L, Ward-Leonard; West, Westinghouse; N. E., North East; Split, Splitdorf. Motor: A-L, Auto-Lite, G & D, Gray & Davis; Leece-N, Leece-Neville; West, Westinghouse

Giving Ignition, Starting, Lighting, Battery, Lamp, Spark Plug and Horn Data

Amp	Base Contact	LAMP CANDLEPOWER, VOLTAGE AND TYPE OF BASE								SPARK PLUGS			Horn	Make and Model	
		HEADLIGHTS		SIDELIGHTS		TAILLIGHTS		DASHLIGHT		Make	Diam. Inches	Thread Pitch			
		Volts	CP.	Volts	CP.	Volts	CP.	Volts	CP.						
10	Single	6-8	15	*6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	United	Liberty	10B
	Double	6-8	21	6-8	4	6-8	4	d6-8	2	A. C.	7/8	18	Klaxon	Locomobile	38-2
30	Single	6-8	21	6-8	4	3-4	2	*3-4	2	Champion	7/8	18	E. A. Lab.	Maibohm	B
	Single	6-8	21	*6-8	9	6-8	4	6-8	4	A. C.	7/8	18	Sparton	Marmon	34
	Double	12-16	21	*12-16	2	12-16	2	12-16	2	Champion	7/8	18	Schwarze	Maxwell	25
	Single	6-8	21	*6-8	12	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon	McFarlan	27
10	Single	6-8	21	*6-8	4	6-8	4	6-8	4	Champion	7/8	18	Sparton	Mercer	Ser. 4
	Double	6-8	15			s6-8	2	6-8	2	A. C.	7/8	18	A. E. L.	Mitchell	E-40
	Single	*6-8	15	d*6-8	4	d6-8	2	d6-8	4	A. C.	7/8	18	Klaxon	Moline Knight	L
										Champion	7/8	18	Klaxon	Monitor	
20	Single	6-8	21			6-8	2	d6-8	2	Champion	7/8	18	Trojan	Moon	All
	Single	6-8	20	6-8		6-8	2			Champion	7/8	18	Garford	Moore	30
5	Single	6-8	15	*6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Stewart	Nash	
		6-8	15	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Sparton	National	6
		6-8	15	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Trojan	National	12
	Double	12-16	15	12-16	4	12-16	2	12-16	2					Nelson	
20	Single	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Klaxon	Oakland	34-B
	Single	6-8	15	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Optional	Oldsmobile	37-A
										Champion			E. A. Lab.	Olympian	45
	Single	6-8	12			3-4	2	*3-4	2	Champion	1/2		Auto-Lite	Overland	90
10	Single	6-8	33	*6-8	4	6-8	2	6-8	2	A. C.	7/8	18	Sparton	Packard	3-25
	Single	6-8	15	6-8	4	6-8	2	d6-8	2	A. C.			Torjan	Paige	All
	Single	6-8	32			6-8	2	6-8	4	Champion	7/8	18	E. A. Lab.	Pan-American	6 48
	Single	6-8	15	6-8	2	3-4	2	*3-4	2	A. C.			E. A. Lab.	Paterson	6-46
10	Single	6-8	15	6-8	4	6-8	2	6-8	2	A. C.			Sparton	Peerless	Ser. 4
	Single	6-8	21	*6-8	4	6-8	4	6-8	4	A. C.	7/8	18	Klaxon	Pierce-Arrow	B-5
	Single	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Schwarze	Pilot	6-45
	Double	6-8	21	*6-8	4	6-8	2	d6-8	2	A. C.	7/8	18	Stewart	Premier	6-C
5	Double	6-8	15			3-4	2	*3-4	2	A. C.	7/8	18	Trojan	Reo	T & U
													Klaxon		
	Double	6-8	20	*6-8	8	6-8	4	6-8	4	Rajah	7/8		Klaxon	Revere	
	Single	6-8	15	*6-8	4	6-8	4	d6-8	4	Champion	7/8	18	Sparton	Roamer	6-54
15	Single	6-8	15			6-8	2	6-8	2	A. C.	7/8	18	Schwarze	Saxon	Y-16
	Single	6-8	15			6-8	2	d6-8	2	Champion			Stewart	Sayers	
	Single	6-8	15			6-8	2	6-8	2	A. C.			Trojan	Scripps-Booth	
													Klaxon		
20	Single	6-8	15	6-8	2	6-8	2	d6-8	2	A. C.			Fitzgerald	Seneca	H
	Single	6-8	15		4	6-8	2	d6-8	2	A. C.	7/8	18	Klaxon	Singer	19
	Double	6-8	21	*6-8	4	6-8	2	6-8	2	Splitdorf	7/8	18	Klaxon	Standard	8-G
	Double	6-8	21	*6-8	4	6-8	2	6-8	2				Klaxon	Stanley	735
20	Single	12-16	21	*12-16	4	12-16	2	12-16	2	A. C.	7/8	18	B. & A. Lab.	Stearns	SKL-4
	Single	6-8	15	6-8	2	6-8	2	6-8	2	Champion			Trojan	Stephens	80
	Single	6-8	21			6-8	2	6-8	2	Champion	1/2		Sparton	Studebaker	EH
	Double	6-8	15	*6-8	4	6-8	2	6-8	2	A. C.			Klaxon	Stutz	G
15	Single	6-8	21	*6-8	4	6-8	2	6-8	2	Champion	7/8		Schwarze	Templar	445
	Single	6-8	21	6-8	2	6-8	2	d6-8	2	Champion	7/8	18	Klaxon	Tulsa	A-D-1
5	Single	6-8	21	*6-8	4	6-8	2	d6-8	2	Champion	7/8	18	Sparton	Velie	38
	Single	6-8	15	*6-8	4	3-4	2	d3-4	2	A. C.	7/8	18	Klaxon	Westcott	
	4 S-D2	6-8	21	6-8	4	3-4	2	*3-4	2	Champion	7/8	18	Klaxon	Willys-Knight	88-4
													A. L.		
20	Single	6-8	21	6-8	12	6-8	4	6-8	2	Champion	7/8	18	American	Winton Six	22
													Electric		

Battery: *Prest-O-Lite*, *Prest-O-Lite*. Wiring system: *GI*, Generator and Ignition combined; *GIM*, Generator, Ignition, Motor combined; *S*, Generator, Motor, Ignition separate; *GM*, Generator and Motor combined. Fuses: *GT*, Glass Tube; *Cart*, Cartridge; *C. B.*, Circuit Breaker. Lamps: *Dashlights in series with taillights; headlight contains sidelight; d,—double contact; s,—single contact.

The Motor Car Repair Shop

Practical Maintenance Hints

How to Test Your Battery

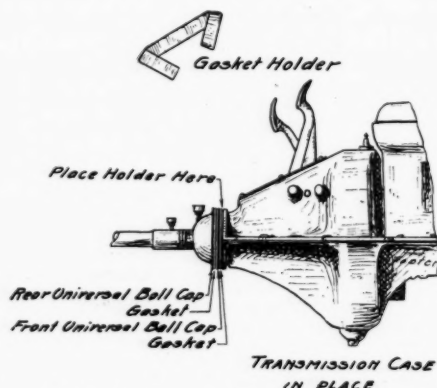
MANY know it is necessary to use a hydrometer syringe to test a storage battery, but they do not always know just how to use it. It is not hard to learn and it is really worth while if a man would save himself from a battery repair bill. Here are the instructions on the use of an hydrometer as sent out by the Willard Storage Battery Co.

The hydrometer has a scale graduation in the upper part of the tube ranging from 1.150 to 1.300 with 0.005 graduations and reads correctly at 70 deg. Fahr. A fully charged cell should read about 1.280 and a completely discharged cell should read about 1.150 specific gravity, both of which are marked by a red line on the scale.

The hydrometer test should be made before distilled water is added. If distilled water is added and then the test is made, the reading will not be correct.

Make the test as follows:

- 1—Remove vent plug from top of cell.
- 2—Force the air out of the hydrometer syringe by squeezing the rubber bulb.
- 3—Insert rubber tube through the vent plug hole into the electrolyte, or battery solution.
- 4—Release the bulb and draw up sufficient electrolyte into the glass tube to float the hydrometer.
- 5—See that the hydrometer floats freely, touching neither top, bottom nor sides.



Replacing transmission brake bands

6—Move the hydrometer syringe so that the level of the electrolyte in the glass tube is on the level of the eye.

7—Read the point on the hydrometer scale which appears level with the top of the electrolyte.

8—Then force the electrolyte back into the cell from which it was removed.

It is advisable to rinse out the hydrometer syringe with water, as the electrolyte will in time destroy the containing case.

In some cars the battery is so placed that it is difficult or impossible to hold the syringe in an upright position over the battery. Under such circumstances pinch the rubber tube with the left hand so that the battery solution will not run

out of the hydrometer. Then lift the hydrometer out and away from the car and hold it upright to take the reading. Be careful not to release the rubber tube until it is again placed over the hold in the top of the cell.

Replacing Gearcase

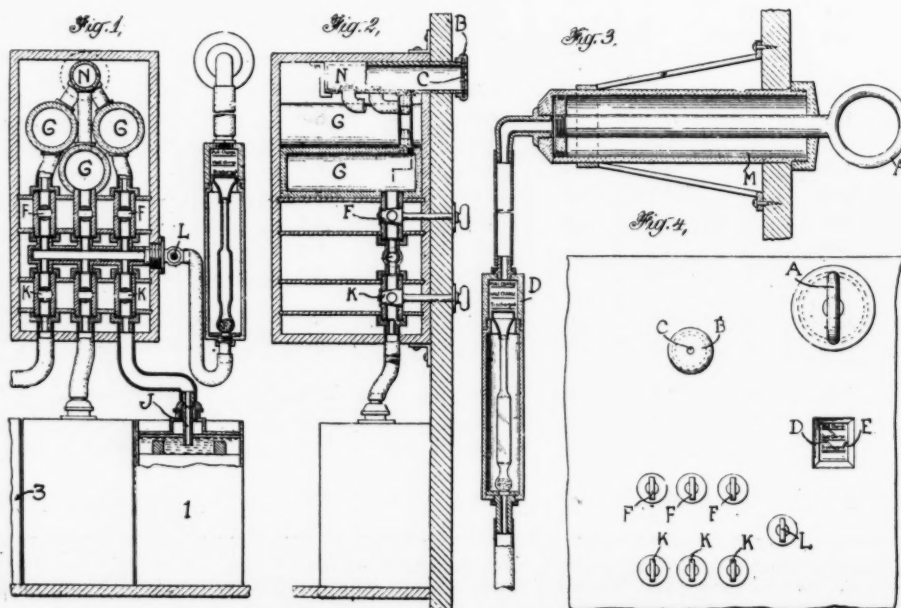
Some time ago the writer found it necessary to replace the transmission brake bands on his Ford car. The gearcase was removed easily, the bands taken out and replaced and the felt gaskets were shellacked and placed in position. The bands were drawn together and the gearcase set over transmission. Here a difficulty arose. Whenever he placed the clutch release ring in position to drop into groove of clutch shaft and the brake lugs lined up to allow brake, clutch and reverse lever shafts to drop into place, the felt gasket between the universal ball cap and the gear case would be forced down and out of place.

The attempt again was made, with the same result. This was repeated several times and patience exhausted. Noticing a piece of tin about $\frac{1}{2}$ by 8 in. on the ground, he picked this up and placed it in front of gasket and bent the ends down over the rear universal ball cap. The attempt was made again and the gearcase dropped into place with the gasket in the correct position.

Solco Battery Flush and Gravity Indicator

A GOOD many battery service station men will tell you that neglect of the battery on the owner's part is responsible for more cases of battery deterioration than anything else. Maybe the hard-to-get-at places some car manufacturers have selected to put their batteries in has something to do with it, but anyway, if the cells do not get water at correct intervals and the electrolyte is not tested regularly, something is going to happen. The time is here when car owners must have on the instrument board a tell-tale device that will give at a glance the condition of the battery. When you look at your ammeter and see it registers no charge when it should, you get worried, but when your battery is thirsting for water, no one cares, until the floor boards are removed for some other purpose and the sad condition of the battery then is discovered.

To test the battery's pulse at all times the Solco battery flush and gravity indicator has been brought out by I. R. Solomon, Los Angeles, Cal.



In Fig. 4, A is the handle of a suction barrel shown in Fig. 3. B is the cap that can be removed to load the water holders. C is an adjustable air orifice for air pressure. D and E show the visible part of the system. It is this visible part that indicates whether water is needed or whether the cell gravity is such that the cell is fully charged, half charged, or discharged. F shows valve handles that open the water from water holders G as shown in Figs. 1 and 2. K shows valve handles that control individual opening to the cells of the storage battery as shown in Fig. 1. L shows the valve handle that opens or closes to the action of handle A so indications can be had, D and E, visible indicator.

Fig. 3 shows how the suction barrel M is connected to the hydrometer of the system. Fig. 2 gives a view that shows how the water holders G can each be loaded with distilled water through the removal of cap B, through tube N. Valves F and K as well as L, are kept closed while filling water holders G.

Fig. 1 shows exactly how the system works. Note here that water holders G are shown on different elevations. Fig. 2

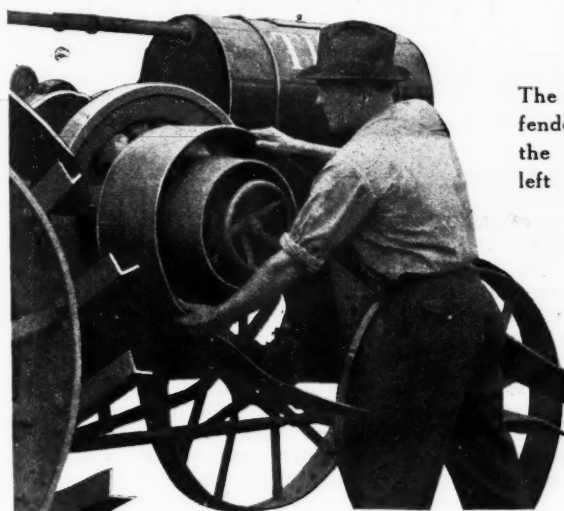
shows that water holders G are on one level. The latter is to prevail in practice.

To operate the Solco, all that is necessary is a pint bottle of distilled water placed in the side pocket of the front door, or in a place where it can be reached by turning in the seat of the car, or accessibility to distilled water which is carried by almost every garage or gasoline station in the world. First you see that valves L, F and K show closed. Then remove cap B, Figs. 2 and 4. Then fill water holders G with distilled water until tube N shows you cannot get any more distilled water into holders G. Now put back cap B, and see that air orifice is closed. The latter is to be arranged in the service equipment to take care of itself. Now the system is loaded and the car driver feels he can drive anywhere and his storage battery will get care wherever he is.

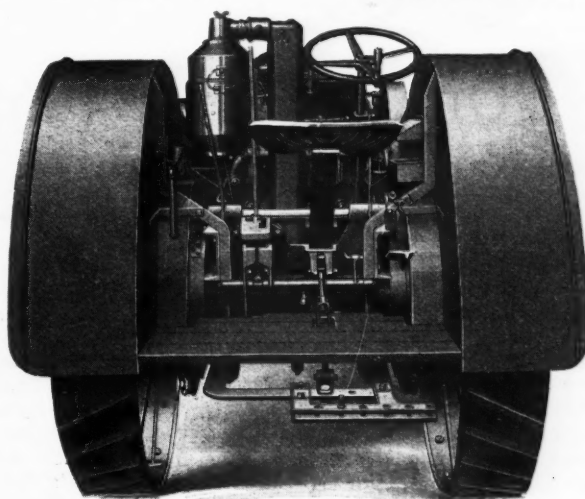
To give this care, here is all the car

owner or operator has to do. First open valve K to cell 1, then open valve L, then drawout on A. If no indication of electrolyte shows D empty, then he knows cell 1 needs water. Then push A back, close L, and open valve F that leads to cell 1—this will be indicated F on instrument board—and, behold, the cell 1 has been flushed right from the instrument board by turning a valve thereon.

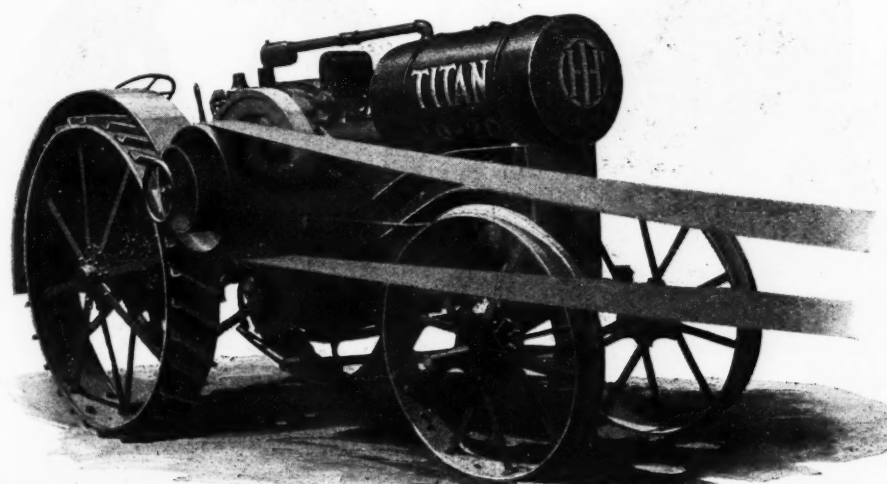
Now he goes to cell 2, by opening valve K to cell 2 and valve L and pulls A out. The indicator shows electrolyte with indicator float E showing between half and full charge. This cell needs no water and the electrolyte is in good condition. Then he pushes A back and closes valve K to cell 2. Then he tests cell 3, and finds enough electrolyte because in D, if solution shows, no flushing is needed; yet he finds the indicator E between half charge and discharge. This cell needs watching, so if the indicator shows discharge, see a mechanic.



The improvement in fenders is shown at the right, while at left is the safety shield



Titan Tractor Is Reduced to \$1,000

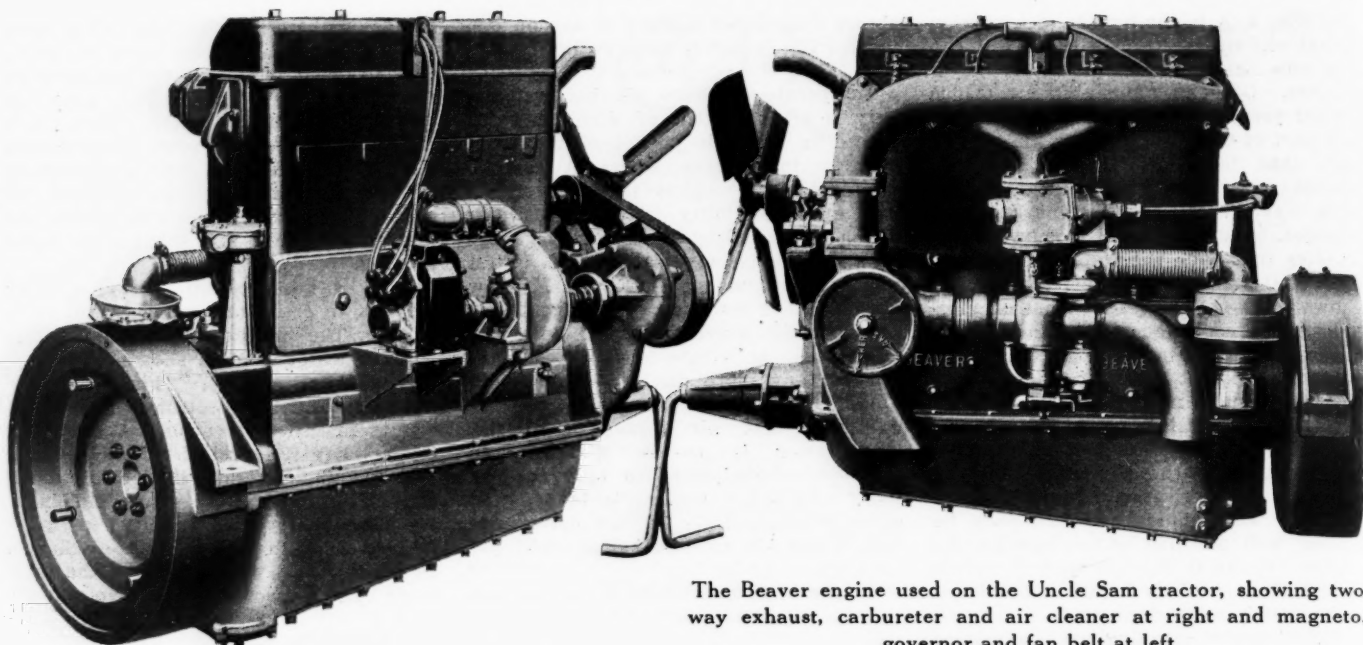


The Titan tractor as it appears with its changes

CHICAGO, July 14—The International Harvester Co. announces a reduction in the price of the Titan 12-20 tractor from \$1,225 to \$1,000, effective this week. In making the announcement the company says the cut of \$225 is made in anticipation that the increased volume of business developed will justify the reduction. Furthermore, it is admitted the cut was made in response to the general belief on the part of the farmer that now the war is over tractor prices should be reduced and because of his conviction that a price of approximately \$1,000 for a three-bottom tractor is enough.

No change in dealer discount accompanies the reduction, hence the dealer who would make as much money selling Titan tractors as he did before must sell more machines.

The Titan has been improved in several particulars, although none of them are fundamental. A safety shield has been put on the pulley so belts can be slipped on while the pulley is in motion without danger to the operator. The fenders have been lengthened and widened, and operator's platform added.



The Beaver engine used on the Uncle Sam tractor, showing two-way exhaust, carbureter and air cleaner at right and magneto, governor and fan belt at left

Uncle Sam a Three-Plow Tractor Model

Will Carry Air Starter and Electric Lights as Extra Equipment

THE Uncle Sam tractor, a standard four-wheel type machine, of three-plow capacity, weighing but 4000 lb., rating as a 20-30 and selling for \$2,300, has reached the stage of production in the new factory of the U. S. Tractor & Machinery Co., Menasha, Wis.

The engine in the Uncle Sam is a Beaver four-cylinder, vertical, valve-in-head heavy-duty tractor type, with 4 $\frac{1}{4}$ by 6-in. bore and stroke and 900 r.p.m. normal. Standard equipment on the engine includes Bennett kerosene carbureter, Bennett air cleaner, Dixie magneto with impulse starter, Duplex governor, Perflex radiator, centrifugal water pump and Sylphon regulator. Lubrication is force feed and splash.

A special feature is the patented two-way exhaust which will throw the exhaust through the producer part of the carbureter or directly out through the muffler. All moving parts about the engine except the fan and the fan belt are inclosed but readily accessible in cases of emergency.

Special Equipment

Special equipment, at an increase in price, includes a Christensen air starter and electric lights and storage battery.

The clutch is twin-disk and is contained within the bell housing of the fly-wheel. An easy adjustment without the use of tools is provided for taking up the wear on the disk.

The gearset is Nuttall, set in a dust-proof housing and running in a bath of oil. The bearings are Timken throughout, there being, including those in the front axle, eighteen sets of roller bearings. Final drive is live axle in dust-proof housing. The entire transmission

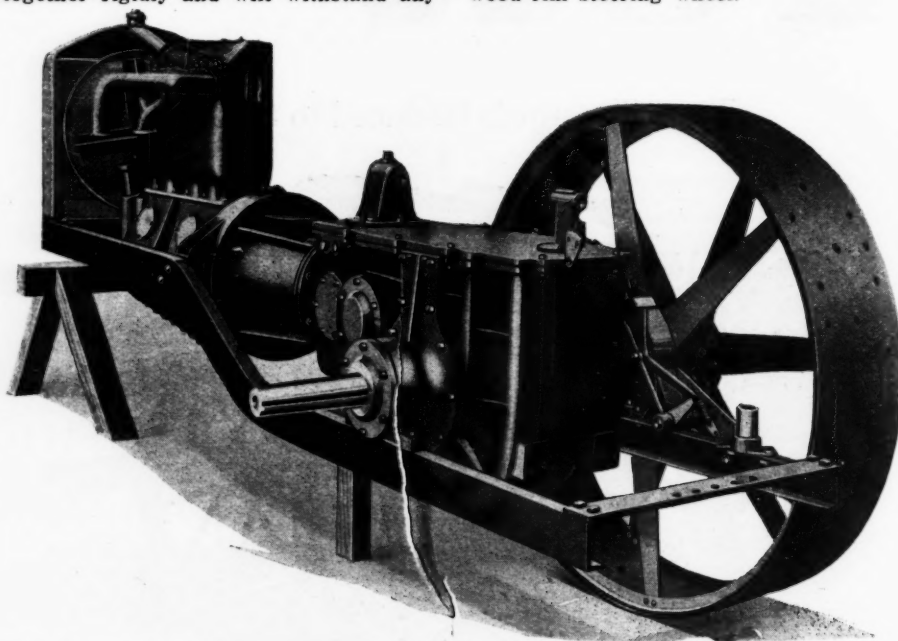
assembly is accessible by removing the cover to the housing.

The power takeoff is patented and is so near the front of the gearset that the 11-in. pulley stands well in front of the rear wheel. The pulley has a 7-in. face and a normal r.p.m. of 900. Thirty horsepower is delivered by the belt at the S. A. E. standard speed of 2600 r.p.m.

While the Uncle Sam has a 4-in. angle steel frame, its construction is essentially of the frameless type. The engine and transmission housing are bolted together rigidly and will withstand any

strain likely to be thrown upon them without the assistance of the frame. The latter, as a matter of fact, is merely a support for the radiator, drawbar and other fixtures.

The front axle is I-beam steel with motor car type steering knuckles. Both the steering knuckles and front axle arms have Timken roller bearings. The axle is suspended from a half-elliptical spring and connection with the powerplant is ball and socket. The steering gear is worm and sector with 17-in. wood rim steering wheel.



Housing that covers all the working parts of the Uncle Sam tractor and relation of frame to engine and transmission assembly

In designing the Uncle Sam consideration has been given to the comfort of the operator. The machine has a comfortable, upholstered, lazyback seat, and there is plenty of leg room. All the controls are within easy reach and the operator sits so far to the rear that it is easy for him to manipulate whatever tool he may be pulling.

In plowing both rear drive wheels run on the land, but the tread of the front wheels is so much wider than that of the rear, that the right front wheel runs in the furrow and operates as an automatic steering device.

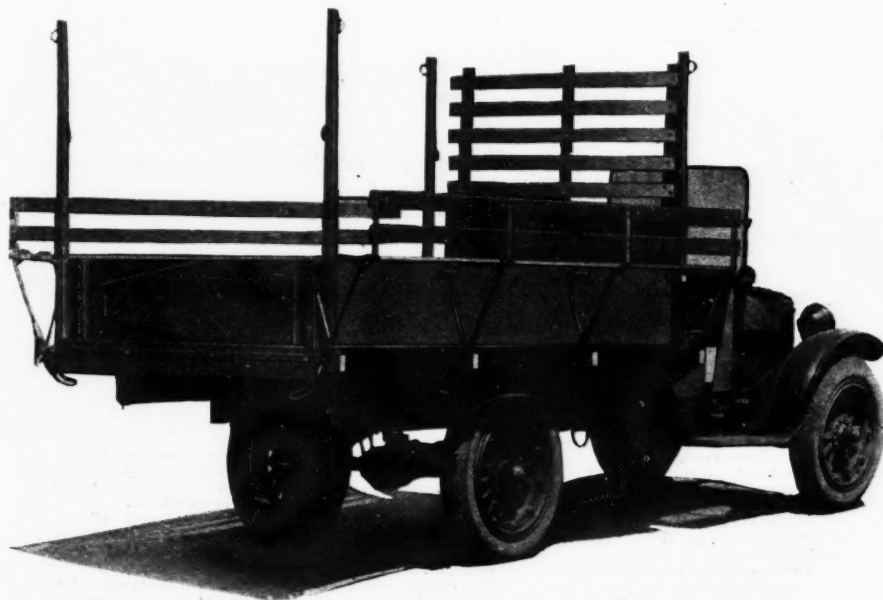
Specific details give 143 in. as the extreme length; front width, 74 in. and rear width, 54 in. overall; wheelbase 85 in.; rear-tread 42 in. and front 68 in.; drive wheel face 12 in. and diameter 50 in.; front wheel 6 in. face and 36 in. diameter; fuel tank capacity 22 gal. kerosene and 4 gal. gasoline; speeds, normal, 2½ m.p.h., high, 3¾ m.p.h., reverse, 1¾ m.p.h. The drawbar pull at normal speed approximates 3000 lb.

The first unit of the new factory at Menasha was completed very recently and is now occupied by the company for assembling. The company owns ample space and the stakes already are set for additional room as soon as production and demand require expansion of facilities.

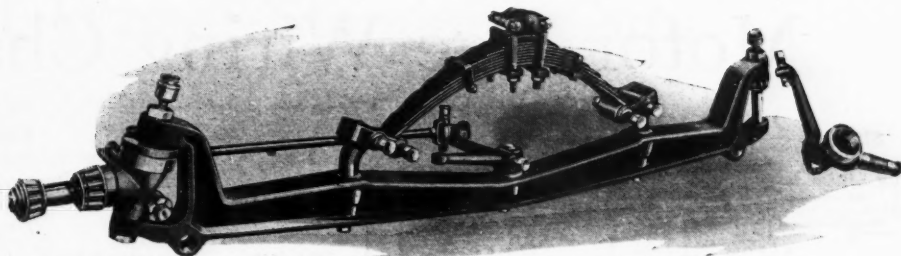
All-Purpose Body for Trucks

AN all-purpose truck body has been brought out by the Highland Body Mfg. Co., Cincinnati, Ohio, as the Every-way. It is designed to meet the need for a truck body that can be used for diversified loads. Three sizes are offered: ¾- to 1-ton truck capacity, 62 by 96 loading space; 1½ to 2-ton truck capacity, 62 by 126 loading space; and 3 to 3½-ton truck capacity, 62 by 144 loading space.

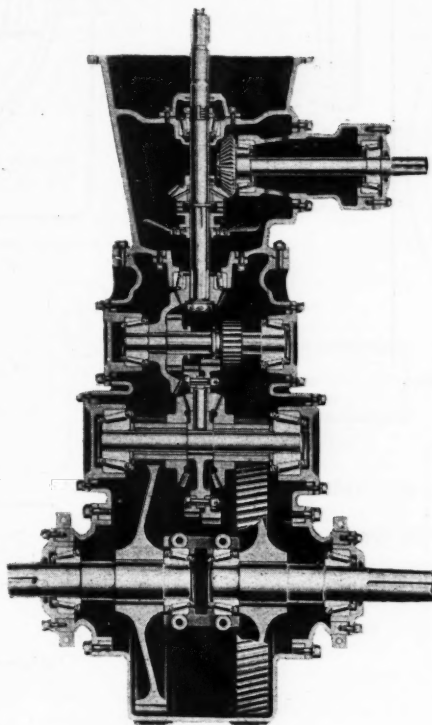
The body is self-contained. All parts that go to make up the various designs



All-purpose truck body as a basket or passenger carrier



Front axle construction of Uncle Sam tractor, showing spring suspension



Uncle Sam gearset, showing the patented power takeoff

into which it is converted are on the truck at all times. Sills, floorboards, slats and stakes are of seasoned oak, and

all joints are made up with white lead. This gives a grain-tight body.

The Commerce Motor Car Co., Detroit, has added this to its body equipment line.

The truck for farm use will haul grain in bags, bulky produce, farm produce in crates, cement in bags, barnyard fertilizer, poultry in crates, farm machinery, dressed meats, fence posts, fruit and vegetables in baskets, boxes or crates, baled hay, wheat, oats or corn stalks, coal, dirt, gravel, hogs, cattle, sheep, cotton, sugar cane, apples, potatoes, melons, cabbages, etc., etc.

For city use it can be used to transport the raw material on one trip and bring back the finished product. It can be used as a passenger bus, service pickup wagon, carrying bottles, baggage, express, grain, wood, ice, furniture, hardware, fruit, dairy produce, etc., etc.

On a 1-ton Commerce chassis, equipped with solid tires, it will list for \$1,725; on a 1½-ton Commerce chassis, equipped with 35 by 5 pneumatic cord tires, \$1,850; and on a 2-ton Commerce chassis, with 36 by 6 pneumatic cord tires, \$2,120.

PROTECTING ROADS FROM CLEATS

Milwaukee, Wis., July 11—Damage of public highways in Wisconsin by the operation of tractors or other farm machinery having cleats on wheels exposed to the surface of the road is aimed to be prevented by a new law of the 1919 legislature, which has added the following new section to the state highway code:

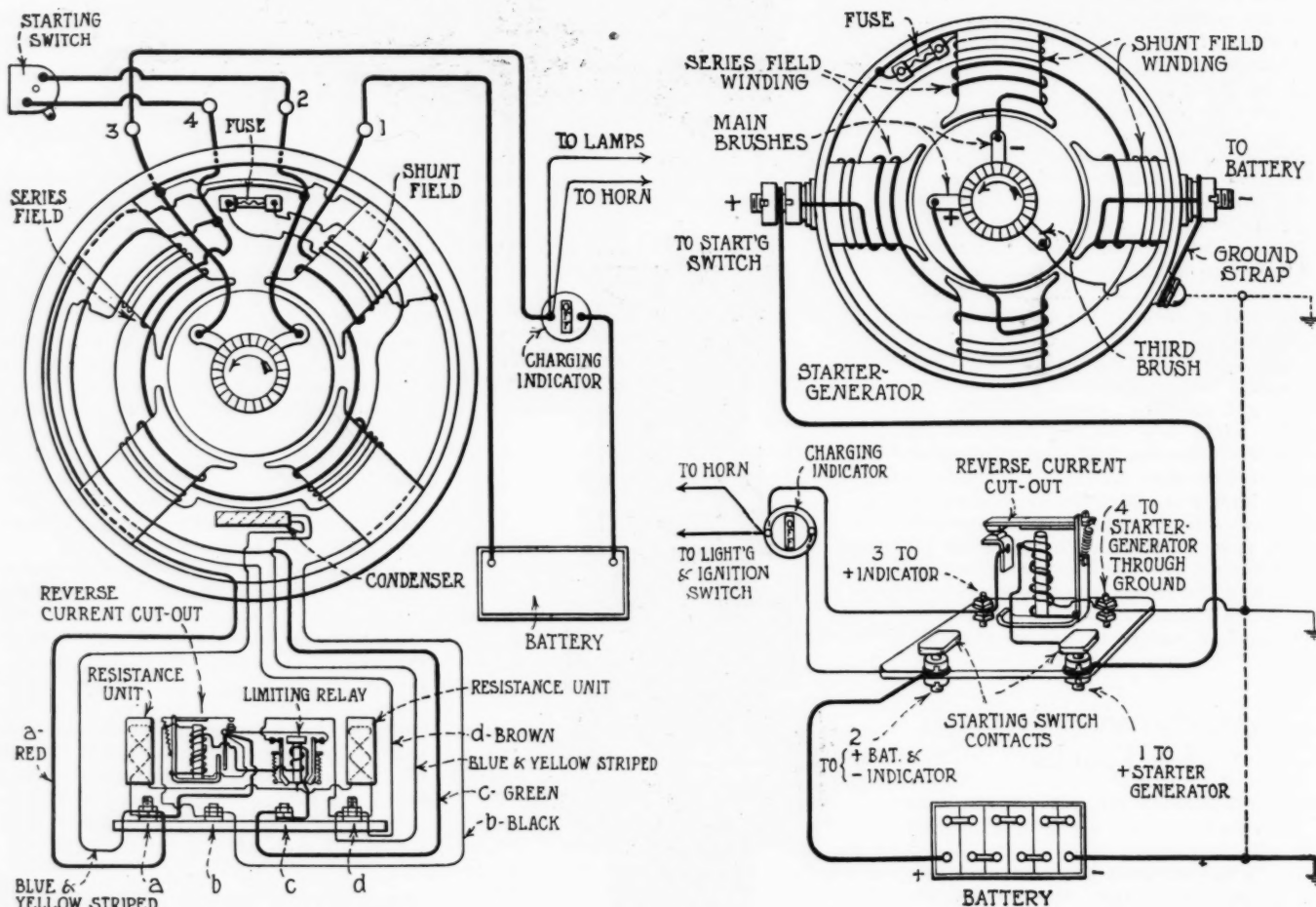
"No person shall, within the limits of any public highway, plough, cultivate or otherwise work any lands in such manner as to interfere with or obstruct the drainage in any public highway ditch, nor shall any person operate any farm or other machinery on, over, along or across any public highway in such manner as to materially damage the said highway."

A fine of from \$10 to \$50, or imprisonment from ten to thirty days, is provided as a penalty, in addition to which the violator must restore or pay the expense of restoring the highway to its former condition.

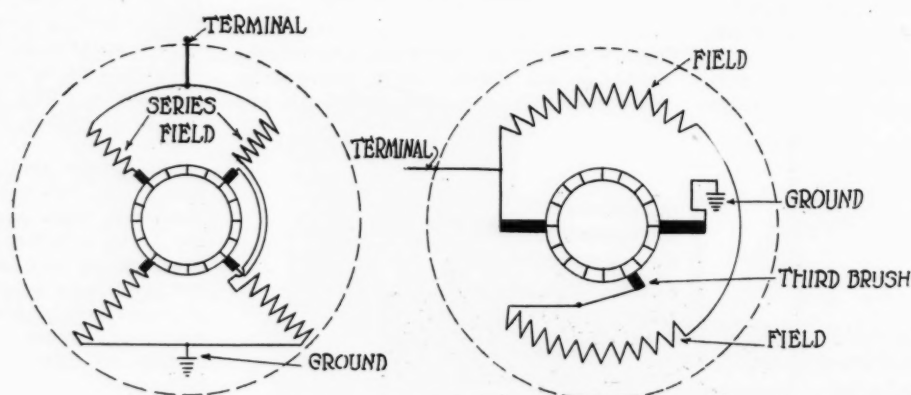
POST TRACTOR PRODUCTION SOON

Cleveland, Ohio, July 11—The Post Tractor Co. expects to get into its new factory within the next thirty days and immediately will go into limited production. The company is arranging to build about five machines a day for the present, increasing as soon as possible.

Motor Age Wiring Chart No. 37



Internal diagram of North-East system with external regulator Internal diagram of North-East system with third brush regulator



Internal diagrams of the starting motor, left, and generator, right; on the Essex

Special System for Fords—May 15-22
General Battery Charging—May 20
General Magneto Diagrams—June 5
Internal Connections—July 10

Abbott—March 20-27
Alco—April 24
Alter—Nov. 4
Apperson—March 6
Buick—Nov. 21-April 3
Cadillac—Dec. 9
Cartercar—May 1
Cole—Jan. 23-April 3
Case—Feb. 27
Chalmers—Feb. 20
Chandler—April 3

Chevrolet—Nov. 28-Mar. 27
Crow-Elkhart—June 26
Davis—May 8
Detroitter—March 6
Dodge—Dec. 12
Dort—March 13
Elgin—Feb. 27
Empire—March 13
Ford—Jan. 30
Franklin—June 19
Grant—Feb. 27-March 27

Henderson—April 3
Hudson—Dec. 5-May 1
Hupmobile—Feb. 13
Interstate—March 13
King—July 3
Kissel—July 3
Krit—Feb. 6
Lexington—April 24
Little—March 20
Locomobile—Jan. 23-April 17
Maxwell—Jan. 16

Marion—March 6-20
Mercer—Jan. 23
Michigan—March 20
Mitchell—Jan. 9
Murray—May 1
National—June 19
Oakland—Jan. 2
Oldsmobile—Jan. 23
Overland—Nov. 7-14
Packard—June 19
Paige—July 3
Paterson—June 26

Premier—April 10
Pullman—April 10
Regal—Feb. 6-April 10
Reo—Feb. 27
Saxon—April 17
Scripps-Booth—Dec. 26
Simplex—April 17
Stanley—June 26
Stearns-Knight—April 24
Studebaker—April 26
Velle—April 24
Westcott—May 8

Tire and Wheel Standard Data

Motor Age Maintenance Data Sheet No. 45

One of a series of weekly pages of information valuable to service man and dealer—Save this page

Solid Tire Sizes

Inches	Mm.	Inches	Mm.
32x3.....	75/660	36x 6.....	150/762
32x3½.....	90/660	40x 6.....	150/864
34x3½.....	90/711	36x 7.....	176/762
36x3½.....	90/762	40x 7.....	175/864
32x4.....	100/660	36x 8.....	200/762
34x4.....	100/711	36x10.....	250/762
36x4.....	100/762	40x10.....	250/864
34x5.....	125/711	40x12.....	300/864
36x5.....	125/762	40x14.....	350/864
40x5.....	125/864		

Note—These tire sizes have been adopted by N. A. C. C. and the Rubber Association of America.

Solid Tires for Single and Dual Wheels

The following definite front and rear wheel application of the proposed solid tire sizes is recommended as supplementary to the proposed standard:

Tires for single wheels		Tires for dual wheels	
32x3	36x4	36x4	36x 8 (Single tire fits 36x4 dual wheel)
32x3½	34x5	36x5	36x10 (Single tire fits 36x5 dual wheel)
34x3½	36x5	40x5	40x10 (Single tire fits 40x5 dual wheel)
36x3½	36x6	40x6	40x12 (Single tire fits 40x6 dual wheel)
32x4	36x7	40x7	40x14 (Single tire fits 40x7 dual wheel)
34x4			

Carrying Capacity of Solid Tires

Solid tire width	Up to and including 36 in. diameter	40 in. diameter
3.....	1000	.....
3½.....	1300	.....
4.....	1700	.....
5.....	2500	2600
6.....	3300	3500
7.....	4200	4500
8.....	5200	5600
10.....	7000	7500
12.....	.....	9500
14.....	.....	11500

Solid Tire and Wheel Diameters, Wheel Circumferences

Nominal outer diameter of tires		Actual diameter over steel bands		*Actual circumference over steel bands	
In.	Mm.	In.	Mm.	In.	Mm.
32	810	26	660.4	81 11/16	2074.7
34	860	28	711.2	87 31/32	2234.3
36	910	30	762.0	94 1/4	2393.9
40	1010	34	863.6	106 13/16	2713.1

*These felloe circumferences are given with the tolerances neglected. The tolerances are shown at the bottom of page 8, S. A. E. Handbook, Vol. I.

Solid and Pneumatic Tire Equipment for Commercial Vehicles*

Front			Rear		
Maximum Size wt. per truck wheel	Pneu. tire size	Solid tire size	Maximum Wt. per wheel	Pneu. Tire size	Solid tire size
800	33x4 or 35x5	None	1600	35x 5	None
1 1000	34x4½	34x3½ or 36x3½	2100	36x 6	34x 5 or 36x 5
1½ 1200	34x4½	34x3½ or 36x3½	3000	38x 7	36x 6
2 1500	35x5	34x4 or 36x4	3500	40x 8	36x 7
2½ 1800	36x6	36x5	4000	40x 8	36x 7
3 2000	36x6	36x5	5200	44x10	36x 5D 36x10
3½ 2100	36x6	36x5	5700	44x10	40x 5D 40x10
4 2300	38x7	36x6	6500	48x12	40x 6D 40x12
5 2700	38x7	36x6	7800	48x12	40x 6D 40x12

*These data are submitted as general information only as representing good present-day practice.
All pneumatic tires to be of cord construction.

Carrying Capacities and Inflation Pressures of Automobile Pneumatic Tires

Fabric tires for cars		Cord tires for cars		Cord tires for commercial vehicles	
Tire size	Maximum load per tire	Corresponding air pressure	Tire size	Maximum load per tire	Corresponding air pressure
3	375	45	400	40	.....
3½	570	55	600	50	.....
4	815	65	850	60	850
4½	1100	75	1200	70	1200
5	1500	85	1700	80	1700
6	.....	.....	.....	90	2200
7	.....	.....	.....	100	3000
8	.....	.....	.....	110	4000
*9	.....	.....	.....	120	5000
*10	.....	.....	.....	130	6000

*The loads and pressures for these sizes are S. A. E. recommended practice only.

Pneumatic Tires and Rims for Cars and Commercial Vehicles

Nominal tire and rim sizes		Oversize tire		Tire-seat dia. (rim)		Type of rim
Inches	Mm.	Inches	Mm.	Inches	Mm.	
30x3½	90/585	31x4	105/585	23	585	Clincher
32x3½	90/635	33x4	105/635	25	635	Straight side
32x4	105/610	33x4½	120/610	24	610	Straight side
33x4	105/635	32x4½	120/635	25	635	Straight side
32x4½	120/585	33x5	135/585	23	585	Straight side
34x4½	120/635	35x5	135/635	25	635	Straight side
36x6	150/610	38x7	175/610	24	610	Straight side
38x7	175/610	40x8	200/610	24	610	Straight side
40x8	200/610	.....	.....	24	610	Straight side

Note—These tire and rim sizes will be the only ones used on manufacturers' equipment after Jan. 1, 1919, and conform to Bulletin No. 267 of the National Automobile Chamber of Commerce.

Rims, Cleats and Lugs for Tractor Wheels

Tractor Front Wheels

PLAIN FLAT PLATE RIMS

Wheel Diameter,	Width of Face,	Thickness of Rim,
in.	in.	in.
28	5 or 6	¾
32	5 or 6	¾
36	5 or 6	¾
42	5 or 6	¾
46	4, 5 or 6	¾

FLANGED TYPE RIMS

Wheel Diameter,	Width of Face,	Thickness of Rim,
in.	in.	in.
28	5	3/16
32	5	3/16
36	5	3/16
42	5	3/16
46	4 or 5	3/16

Note: Stock from which flanged tires are made to be 1 in. wider than the face of the finished tire.

Tractor Rear Wheels

Wheel Diameter,	Width of Face,	Thickness of Rim,
in.	in.	in.
42	8 or 10	10 or 12
48	10 or 12	10 or 12
54	10 or 12	10 or 12
60	10 or 12	10 or 12

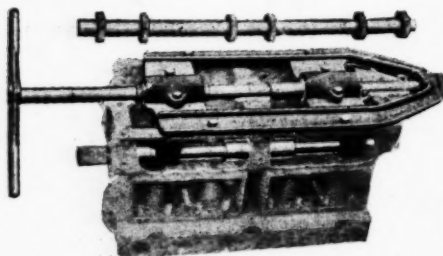
Diameter of holes for lugs and cleats..... 11/16 in.
Diameter of bolts for locking cleats..... ¾ in.

Service Equipment

Time Savers of the Shop

Imperial Compression Couplings

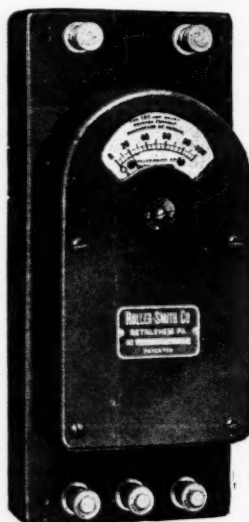
AN assortment of couplings for connecting gasoline, oil and air lines on motor cars and which require no packing is now ready for distribution to the dealer by the Imperial Brass Mfg. Co., Chicago. The assortment is contained in a neat compartment box with an illustrated index chart on the inside of the cover, making it possible to determine instantly the size of joint to be used. The net price to dealers for this outfit is \$8.



Storm babbitting and re boring tool

Tire Dressing Wheel

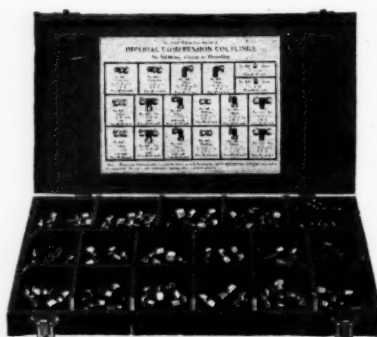
A wheel equipped with removable blades that trims up the tire preparatory to applying the vulcanizing process has as its principal feature that the blades can be replaced when they become worn and dull. The action of the wheel on the tire produces a fine ribbed surface desirable for the perfect cohesion of the cement. The wheel is 5 in. in diameter and 2 in. wide. Bushings can be furnished so that the wheel can be made to fit any sized arbor. The wheel is sold complete for \$15. It is made by the T. & T. Tire Dressing Co., San Francisco, Cal.



Roller-Smith direct current relay

Direct Current Relay

The direct current reverse relay made by the Roller Smith Co., 233 Broadway, New York, is especially valuable for the garage and service station specializing on battery repair. If at any time the source of energy for the charging circuit fails, this reverse current relay cuts out the batteries from the line, thus preventing discharge through the charging resistance.



Imperial assortment of couplings

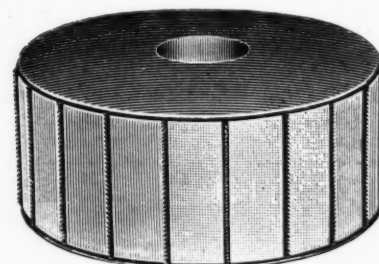
is varied by moving the valve in a longitudinal direction. The movement of the cutter is obtained by moving the cutting head with a hand feed. The lathe is secured to the bench with lag screws through the holes provided for them.

E & S Service Jack

The jack made by the Ellis-Smith Co., Buffalo, N. Y., for service work saves a lot of time in the repairshop. With this jack it is possible to raise a car up in a few seconds to any desirable height, for the pedestal is adjustable. The jack is also valuable as a turning device, for it enables a car to be turned around in a very small space.

Babbitting and Boring Tool

To rebabbit and re bore the Ford bearings with the tool made by the Storm Mfg. Co., Thompson, Iowa, is a task of few minutes. The jig is clamped on the block, the pouring blocks fitted and then poured. After the metal has cooled the boring bar is applied and the excess metal bored out, leaving a perfectly true bearing.



T. & T. tire dressing wheel

Valve Truing Machine

A. C. Savidge, Indianapolis, Ind., has brought out a valve-truing machine that trues up the seat of any valve regardless of the material of which the valve is made or the angle of the face, it is claimed. The crank for turning the valve is clamped directly on the valve stem. The depth of the cut on the face



The E. & S. service jack which can be used as turning device also



Savidge valve-truing machine

The Accessory Corner

New Fitments for the Car

Clamert Headlight Lens

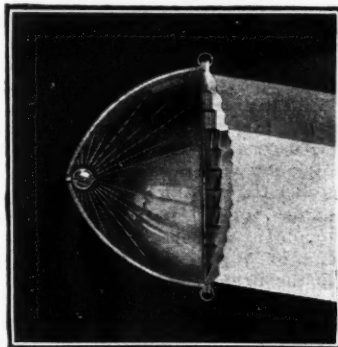
THE Clamert lens, manufactured by the Clamert Mfg. Co., Pittsburgh, Pa., is made up of several prisms, circular and concentric. Those on the inside of the lens deflect the rays downward, while the outer prisms break the rays up. The largest size lens sells for \$2 a pair and smaller sizes are less in proportion.

top of the strangle tube this mixture is met by the other part of the air which is admitted through the opening made by the sleeve as it uncovers the port in di-

rect proportion to the speed of the engine. The Johnson carbureter is made for all cars.

Ignition Harness for Fords

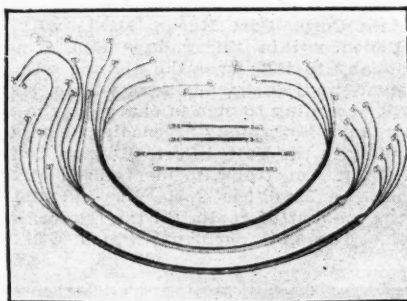
A new ignition harness for the Ford has been announced by Goodrich Lenhart Mfg. Co., Widener building, Philadelphia, Pa. It is the purpose of this harness to inclose the ignition wiring on the Ford in an oil-tight dust-proof housing, which also protects the wiring against mechanical strains. The wires are No. 18 gage, insulated with cotton, varnished. Each wire being a different color renders identification easy.



Clamert lens

Tire Carriers for Fords

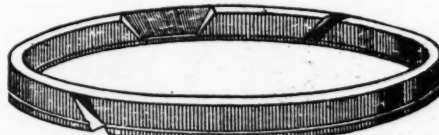
The International Metal Mfg. Co., Philadelphia, Pa., is now under production with a tire carrier for Ford cars that is secured to the rear of the frame and projects outward, providing space for two spare tires. The frame is made of angle irons and fits directly over the channels. There is a heavy steel locking shackle which fits over the tires to be locked. In the center of the carrier is a support for the rear license plate.



Ignition harness for Ford cars

Johnson Carbureter

The Johnson carbureter made by the Johnson Carbureter Co., Detroit, attacks the carbureting problem from a new angle. A floating sleeve and a strangle tube are used, both of which might be called a proportioning valve, and the action of these two is dependent upon the engine speed only. The air, coming in at the intake passage, is divided, part passing down around the outside of the strangle tube and then up through the tube, drawing gasoline with it. At the



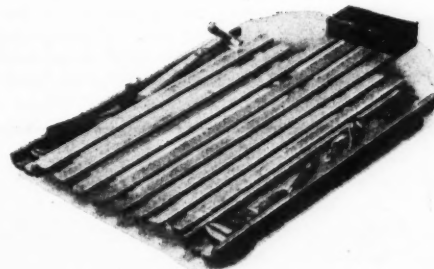
Carbon-O piston ring

Carbon-O Piston Rings

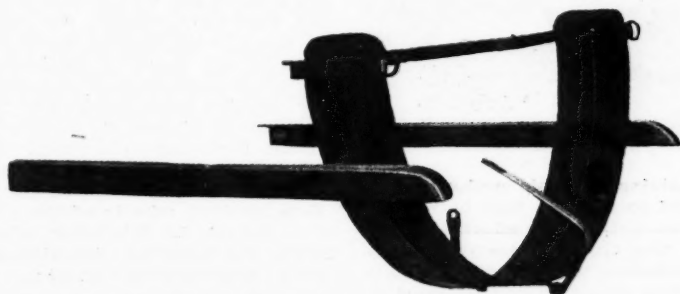
The Steam Tractor Auto & Mfg. Co., Inc., Sioux City, Iowa, in announcing its non-leak piston ring, states the ring expands to fill the piston groove in both directions and it has sufficient pressure to eliminate piston slap to a great degree in cylinders badly worn. This ring is a two-piece ring, and the company is prepared to furnish it for all cars.

Sure Shot Timer

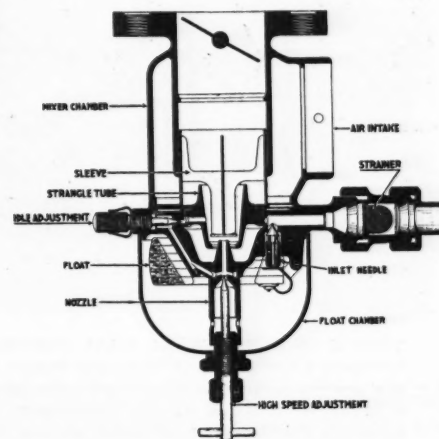
The Sure Shot timer for Fords made by the Aero Mfg. Co., 7 South Clinton street, Chicago, makes use of the wiping-contact principle, using hardened steel contacts to eliminate the wear due to the wiping action. The peculiar shape of the contacts and the broad current collecting surfaces make this timer proof against trouble due to dirty and oily contacts, according to a recent test, which demonstrated that the timer would operate when the contacts were smeared with axle grease. The timer sells for \$2.



Creeper with tool tray



The International tire carrier for Ford cars



New Johnson carbureter

Among the Makers and Dealers

Short Trade Notes

WALSH to Represent Flexite—Charles I. C. Walsh has been appointed sales representative for Michigan and Indiana for the F. R. Blair & Co., Inc., New York, manufacturers of Flexite products.

To Make Dies, Jigs and Tools—The A. E. Hayle Mfg. Co. expects soon to construct a factory at Toledo, Ohio. The company has been incorporated for \$20,000 and will manufacture dies, jigs and tools. Albert M. Mayle is at the head of the company.

Hayes Mfg. Co. Declares Dividend—The Hayes Mfg. Co. has declared a 2 per cent dividend on preferred stock and 1½ per cent on common stock, the latter to be paid in Liberty bonds in multiples of \$50 and the balance in cash. Both dividends are payable Aug. 1 to stockholders of record July 15.

Paige Loading Dock Burns—The loading dock of the Paige-Detroit Motor Car Co. burned recently, destroying sixteen new cars and one truck as well as seventeen railroad freight cars. The fire was of undetermined origin and started in or under one of the freight cars. The cars were covered by insurance. Damage to the dock and box cars is estimated at \$15,000, while the cars and truck destroyed were valued at \$25,000.

Madison Tire Factory Completed—The new plant of the Madison Tire & Rubber Co., Buffalo, N. Y., is soon to be in operation. The building has been completed and modern machinery is now being installed. By the end of July the plant will be producing 250 tires and 250 tubes daily, according to the management. It is hoped to increase production to 1000 tires and 1000 tubes daily soon. The firm has head-

quarters in New York. About 300 workers are to be employed in the Buffalo factory.

Henry Becomes Sales Manager—H. E. Henry, formerly sales manager of the Fulfo Pump Co., Blanchester, Ohio, has been appointed sales manager of the Michigan Machine Co., Detroit.

Atterbury Plans Extensions to Plant—Plans for the first of a series of additions to the plant of the Atterbury Motor Car Co., Buffalo, N. Y., have been made. The first building to be erected, to be used primarily for service purposes, will be 80 by 180 ft. and will cost \$50,000. Plans are being drawn for an assembly building 450 by 100 ft., costing \$150,000.

Prudden Wheel Resumes Dividends—The Prudden Wheel Co. declared a cash dividend of 5 per cent payable July 15. This is the first dividend since 1917. The action does not mean that the company has resumed the 10 per cent per year dividend basis, although it is probable that the action amounts to this. When war interfered with production in 1917 the company was paying a 2½ per cent per quarter.

American Machines Corp. Reorganizing—Creditors of the defunct American Machines Corp., Port Huron, Mich., will be satisfied within thirty days and a new company to take over the old one will be opened and doing business within sixty days, according to men in charge of the old company. Bankruptcy proceedings are now pending in the United States Circuit Court. A. Grant Armstrong, formerly head of the American Machines Corp., has enlisted a large amount of capital in the reorganization. The new company, which will be

known as the General Harvester Co., has filed articles of organization with the secretary of state and has obtained options on five large plants throughout the country, two of which are to be moved to this city, according to Mr. Armstrong. The new company will manufacture farming implements and automotive parts. New York capitalists have financed the project.

Chevrolet Promotes Factory Men—Charles F. Barth, manager of the engine and axle department of the Chevrolet Motor Co., Flint, Mich., has been promoted to general manager, while Thomas E. Houghton, manager of the assembly department, has been promoted to factory manager of the company.

St. Louis Ready for New Cleveland—The Lewis Automobile Co., Chandler distributor in St. Louis, Mo., has leased a 50 by 150-ft. two-story building as a salesroom for the Cleveland light six. The new company will be known as the Cleveland-Lewis Automobile Co., and E. O. Stagg, wholesale manager of the Lewis company, will be manager.

Woman Manages Accessory Branch—Miss Nora E. Love is the first woman to manage an accessory branch in St. Louis. She is in charge of the Wearwell Tire Store, where products of the Wilson Tire & Rubber Co., Springfield, Ill., are handled. She was formerly connected with the factory and later managed the Washington, D. C. branch.

Fox River Tractors to Build Later—The Fox River Tractor Co., Appleton, Wis., is building a small shop for experimental and assembling purposes and early next spring will build its new plant. The company is a new one, organized with \$200,000 capital, and will manufacture a four-plow machine, designed by Frank and Oscar Saiberlich, who retired recently from the Eagle Mfg. Co., Appleton, to build and market their new type.

P. & O. Plant Has Reopened—The plant of the P. & O. Co., Canton, Ill., recently purchased by the International Harvester Co., has been re-opened after a shut down of several weeks for inventory and repairs. C. B. Reed has been appointed superintendent of the plant. The formal transfer from the old to the new regime was made July 1. The force of employees is being increased and the plant will be operated upon a larger scale than ever before.

Hart-Parr Dealers at Meeting—Fifty dealers, representing 100 counties of eastern Illinois and western Indiana, handling the Hart-Parr tractor, met at the plant of the Illinois Tractor Sales Co., Bloomington, Ill., recently to hear talks by factory representatives and discuss plans for the fall sales campaign. They were the guests of Sam G. Bodman, president of the Bloomington concern. Among the speakers were R. T. Castle, Atchison, Kan., representing the Ballor Plow Co.; J. C. Mergandollar, who is of the Oliver Plow Co., and C. L. Schnuerer, Charles City, Iowa, representing the Hart-Parr company. The development of motor cultivators, soil tillage, service and methods of conducting field demonstrations were dis-



TRUCK IN U. S. AERIAL MAIL SERVICE.—In maintaining daily air mail service between Cleveland and Chicago, White trucks are used to dispatch mail between the postoffice and landing field. The photograph shows the transfer of mail from a plane to a truck at the Cleveland landing field. The truck rushes the mail through the business district of the city to the postoffice, 4 miles distant, in 15 min. Another is used at the Cleveland landing field as an emergency truck to carry supplies of fuel and airplane parts to the hangar

cussed. A banquet wound up the day's program. The reports from the various dealers indicated a successful year so far with an encouraging outlook for the fall, crop prospects being uniformly flattering.

Goodrich Lenses Seaboard Station—The B. F. Goodrich Rubber Tire Co. has leased a six-story concrete and steel building built at Hoboken, N. J., and will utilize it as an export and Atlantic seaboard distributing station.

To Make Economy Carburetor—The Economy Carburetor Co., Milwaukee, Wis., has been organized with a capital stock of \$50,000 to manufacture the Economy carburetor, designed by Eugene Drahonovsky and in practical test for nearly two years. Joseph Stoll and Ray Huelsbeck are associated with the inventor. A plant is being equipped. A special Economy carburetor for Fords will form the principal part of the output.

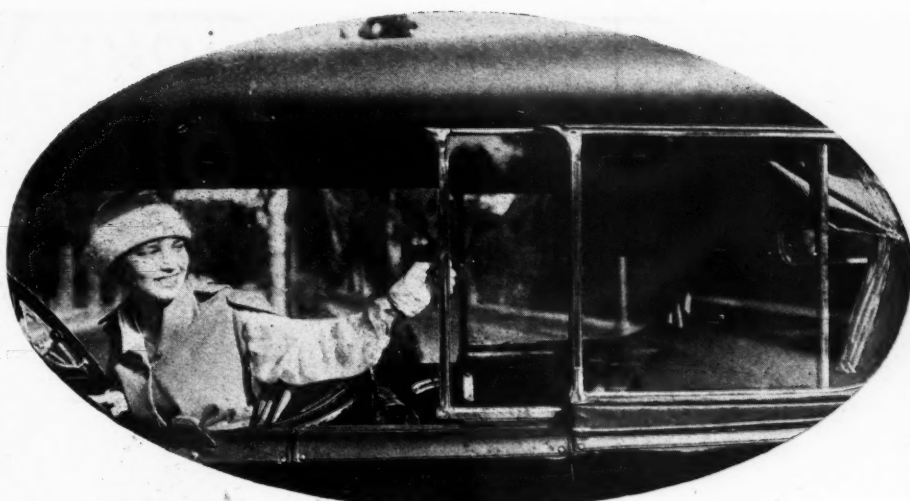
Allen Sells Fostoria Plant—The Fostoria plant formerly used by the Allen Motor Car Co., which recently moved to Columbus, will be occupied by the Fostoria Machine & Tool Co. This is a new corporation which is now in the process of organization. It has been capitalized at \$100,000. The Allen property was purchased by the new concern recently. A four-story brick office building will be erected. The company will employ 250 men at the start.

Stanwood Rubber Equips Plant—The Stanwood Rubber Co., recently incorporated, expects to be in production of tires and tubes by September. Its steel and concrete plant has a floor space of 68,000 sq. ft. and occupies a 7-acre site. Equipment is being installed. Officers of the company are: President, C. E. Barker, vice-president and treasurer of the Mutual Tire & Rubber So.; vice-president, Ed Hutchins, president of the Chipewa Rubber Co. and consulting engineer; treasurer, R. B. Gillette, vice-president of the Gillette Rubber Co.

Hayes Has Testing Laboratory—The Hayes Wheel Co. has installed a testing laboratory where specimens of all material used in the company's seven plants will be tested. The laboratory is located in the west end of the plant formerly occupied by the Mutual Motors and Jackson Munitions Corp. It occupies 2000 sq. ft. of floor space on the second floor. The laboratory will be under Harold J. Smiley, formerly with the Chevrolet Motor Car Co. and previously with the U. S. Steel Corp., the Reo Motor Car Co., and the Briscoe Motor Corp.

Philadelphia Trade Loses Landmark—Trade circles are mourning the loss, by fire, of the famous Roost hotel on Mount Penn, just outside of Reading, Pa., which for several years has been the objective point of various summer outings for the trade associations. It was only on June 25 last that the Philadelphia Garage Association held its sociability run to that point. The Roost, which came into fame some years ago through the tribute paid to its charms by the late Gov. Samuel W. Pennypacker, was destroyed early on the morning of July 5. Sparks from fireworks set off late on the night of the Fourth are assigned as the cause of the fire.

Antigo Tractor Co. Organized—The Antigo Tractor Co. has been incorporated with an authorized capital stock of \$100,000 by business men of Antigo, Wis. It will build a farm and general purpose tractor of the quadruple-drive type designed by D. S. Stewart. The first model has been in demonstration on Northern Wisconsin farms for six months, it is said.



DEALER ADDS TO PERMANENT TOP DEVICES—Harry Lord, Velie distributor in Los Angeles, Cal., invented this sliding glass arrangement. The top and sliding windows may be adapted to any make. When the glass sides are in position the open car becomes snugly inclosed

The company plans to establish a factory at once. William H. Wolpert of Antigo is president.

Milburn Appoints Foreign Representative—The Milburn Wagon Works, Toledo, Ohio, manufacturers of the Milburn electric, have appointed the Automotive Products Corp., New York, as its foreign trade representative.

Witwer Is Factory Manager Now—J. C. Witwer, who has been assistant superintendent in charge of production for the International India Rubber Corp., South Bend, Ind., has been promoted to factory manager. He was formerly with the Kelly-Springfield Tire Co. and with the Goodyear Tire & Rubber Co.

Davissan Is Back From France—Capt. H. L. Davissan, formerly of the Electric Storage Battery Co., Philadelphia, Pa., and the Edison Storage Battery Co., Orange, N. J., has returned from France, where he was in the engineering corps, and now is with the Lawrence Motor Co., which represents the Walker Electric Motor Vehicle Co., Chicago, manufacturer of the Walker electric truck, acting as district sales manager.

Garage for Selden Distributors—Distributors of Selden trucks for Harrisburg, Pa., territory have ordered materials for the erection of a garage and warehouse at Market and Cameron streets. The structure will be built in L shape, with a frontage of 65 ft. on Market street and 50 ft. on Cameron street. The depth is 136 ft. Three storerooms with a center arch for the entrance of cars to the garage portion will be placed on Market street and two more storerooms will be placed on the Cameron street side. These stores, it is planned, will be for accessories.

More Capital for Reliance—The Reliance Motor Truck Co., Appleton, Wis., which was thoroughly reorganized early this year, when Appleton interests gained complete control of the stock, is making such progress that it has been decided to increase the capital stock from \$500,000 to \$1,000,000. As soon as practicable, a four-story building, 70 by 300 ft., will be erected. Besides building the Reliance truck, the company manufactures the Badger external spur gear drive rear axle on a commercial basis. Orders now on the books call for approximately 100

trucks for immediate delivery, and the axle business is flourishing as well. John M. Balliet of Appleton is president and general manager of the company.

Cline Becomes Chicago Manager—H. R. Cline, until recently special representative of the Globe Rubber Tire Mfg. Co. in the east, has been appointed manager of the company's Chicago branch in charge of the central territory.

William H. Walker Dies—William H. Walker, president of the Walker Mfg. Co., Racine, Wis., died of angina pectoris at his home recently. He was sixty-nine years old. He is survived by his wife and three children.

Vaughn Joins Van Blerck Motor—Guy W. Vaughn has been appointed vice-president and general manager of the Van Blerck Motor Co., Monroe, Mich., maker of marine engines. During the war Mr. Vaughn was in charge of production for the Wright-Martin Aircraft Corp., making Hispano-Sulza engines. Previously he was assistant to the president and sales manager of the F. B. Stearns Co., Cleveland. He has been engaged in the automotive field for the last eighteen years.

Flying Corps Men in Company—The Packard Engineering Co. has been organized at Cleveland, Ohio, by Warren Packard, Charles C. Rice and W. R. Davis, formerly with the Navy flying corps. Prior to entering the service Mr. Packard was connected with the Curtiss Aeroplane & Motor Corp. Mr. Price learned to fly in one of the original Wright machines. He has managed several garage and repair stations. The company is installing Philbrin ignition and is the distributor of Miller carburetors and Ford speed specialties. Salesrooms have been opened.

Pierce-Arrow Passes Dividend—The Pierce-Arrow Motor Car Co. has passed its usual quarterly dividend on common stock. Since May, 1917, when the initial common dividend was declared, the company has been paying \$1.25 a share quarterly. Following the directors' meeting it was announced that earnings for the fiscal year had been at the rate of more than \$5 a share per annum on common stock. July 1 the company's bank loan was \$2,150,000 and its cash on hand exceeded this sum, but during the remainder of the year the company will need a considerable amount for contemplated capital expenditure.

From the Four Winds

Glimpses at the World of Motordom



THE TRACTOR THAT CLIMBED PIKE'S PEAK—Here is the caterpillar that conquered the heights of Pike's Peak. It has the distinction now of having attained the highest altitude of any tractor

PENNSYLVANIA Cars Show Big Increase

—Receipts from licenses from Jan. 1 to July 1 of this year are \$559,575 in excess of the receipts for the same period last year for Pennsylvania. The figures for the two periods are 1918, \$3,732,661; 1919, \$4,392,236. The last tag number issued is near the 385,000 mark.

County Votes \$2,000,000 for Roads—Polk County, Iowa, of which Des Moines, is the county seat has voted by a majority of almost four to one in favor of paving its main roads. There was little organized opposition to the proposition and as a result of the overwhelming victory for the good roads at least 20 miles of paved roads will be built this season. The election also authorized the issuance of a maximum of \$2,000,000 in bonds to

finance the paved roads. Fourteen Iowa counties have voted in favor of hard surfaced roads, and only two have voted them down. Elections will be held in several additional counties within the next few weeks.

Five Years for Breaking in Tire Stores

—An organized gang which broke into tire stores and disposed of their loot in an isolated section of Milwaukee, Wis., was sent to prison for long terms in Municipal court July 2. Meyer Askotzky, who conducted a store on the South Side, was given a seven-year term, the same as Arthur McKay, Lewis Custania and Richard Thorsen, accused of burglary. James Rosenfeldt, a fifth member, who turned state's evidence, was given four years in jail. Rosenfeldt told how the gang broke

into the tire store of George Browne early one morning in April and carried off fifty-five casings, valued at more than \$2,000, which were purchased by Askotzky. The confession cleared up the mystery of the theft of more than 250 casings from local tire stores in the last six months.

Would Have Buses for Children—The committee on elementary schools of Philadelphia, Pa., has petitioned the finance committee of the Councils to be allowed to purchase for the use of crippled children a fleet of motor buses to supplant the inadequate horse-drawn vehicles in use at the present time. At least three motor buses probably will be purchased.

Right of Property Owners Upheld—The right of property owners to restrict a district to residences was upheld by Judge X. W. Jayne, issuing a permanent injunction forbidding the erection of a large garage at Seward avenue and Twelfth street. The ruling held that the district west of Hamilton boulevard was one of residence and that a public garage on the site proposed would constitute an unwarrantable annoyance and a danger to children.

Iowa Has Licensed 232,762 Cars—In the period between March 15 and June 30, 232,762 licenses were issued on Iowa cars. In the four months previous to March 593,772 additional licenses had been issued. Fees on the licenses issued between March 15 and June 30 amounted to \$1,739,487. July 1 the motor license department was transferred back to the office of the secretary of state. It was removed from that office during the session of the Iowa legislature last winter on account of the inefficiency charged against the conduct of the office by the former secretary of state, who resigned July 1.

Coming Motor Events

TRACTOR DEMONSTRATIONS

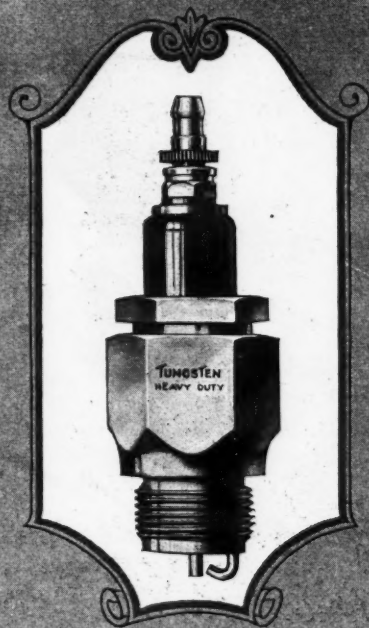
Wichita Kan.	Automotive Committee of National Implement Assn.	July 14
Aberdeen, S. D.	Sectional Tractor Demonstrations.	Aug. 18-22
Ottawa, Ont., Canada.	Inter-Provincial Plowing Match and Tractor Demonstrations.	October

RACES

Uniontown, Pa. ....	.....	July 19
Elgin, Ill. ....	.....	Aug. 23
Uniontown, Pa. ....	.....	Sept. 1
New York ....	.....	Sept. 20
Cincinnati, Ohio ....	.....	Oct. 1

SHOWS

Indianapolis, Ind.	Automobile Trade Association.	Sept. 1-6
Cincinnati, Ohio	Automobile Dealers' Association.	Sept. 13-20
Springfield, Mass.	Eastern States Exposition.	Sept. 15-20
New York	N. A. C. C.	Jan. 3-10
Chicago	N. A. C. C.	Jan. 24-31



Performance

TUNGSTEN

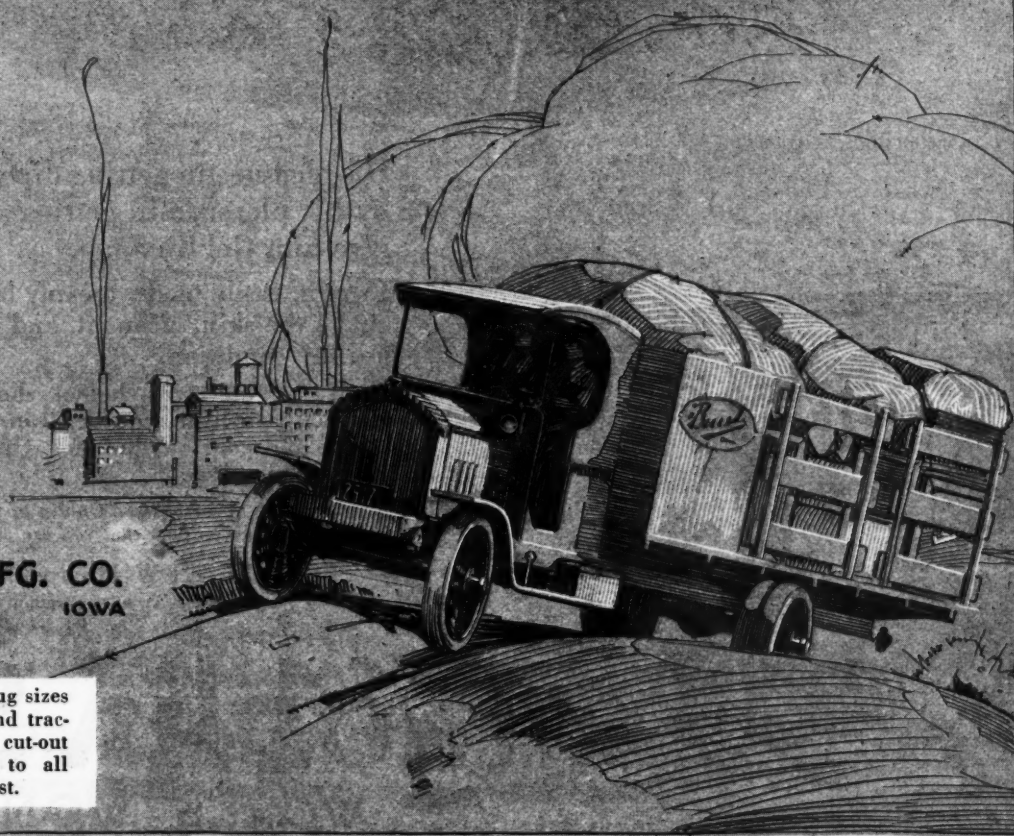
TRADE MARK REGISTERED

SPARK PLUG

Always on the job

TUNGSTEN MFG. CO.
MARSHALLTOWN IOWA

New chart of plug sizes
for cars, trucks, and trac-
tors, and sample cut-out
plug gladly sent to all
dealers on request.





His pleasure in getting dirty is equalled by his pleasure in getting clean if you give him Goblin Soap.

Its rich, easily made, creamy lather is pleasant to the skin, cleans it, and leaves it in a healthy condition.

Good for office or home, shop or garage. Especially fine for a quick clean-up after working around your automobile. Quickly dissolves grease and grime.

If your dealer does not have Goblin Soap, please send us his name and we will see that you are promptly supplied.

CUDAHY, 111 W. Monroe St., Chicago
64 Macauley Avenue, Toronto, Canada



Goblin Soap

WORKS WONDERS

When Writing to Advertisers, Please Mention Motor Age



BIJUR SYSTEM ON ALL TEN FLOORS

A Sign Backed by Service

The Bijur Motor Appliance Company specializes in the design and manufacture of starting and lighting equipment. A ten-story plant located in Hoboken, N. J., is devoted entirely to the manufacture of electrical equipment and supply parts for passenger cars, trucks, seaplanes, airplanes, blimps, and other automotive machines.

The Bijur System was first adopted by Packard in 1912. Today it is standard equipment on the Apperson, Atlas, Commerce

Truck, Grant, Jordan, King, Marmon, National, Packard, Roamer, Templar and Winton cars and has recently been adopted by Peugeot of France.

Over 130 Bijur Service Stations in the leading centers of the country are provided with complete information concerning the various models in service and spare parts and supplies are carried in all the leading cities of the country.

Where to Get Bijur Service

ALABAMA
Birmingham Electric Garage.

ARIZONA
Phoenix Motor Supply Company.

ARKANSAS
Little Rock Brown & Holland.
Hot Springs Brown & Holland.

CALIFORNIA
El Centro Valley Automotive Elec. Service.
Fresno United Auto Electric Company.
Lindsay Central California Elec. Co.
Long Beach Automotive Electric Co.
Los Angeles Electric Equipment Co.
Oakland Motor Electric Co.
San Diego Auto Electrical Equip. Co.
San Francisco Automotive Service Agency.

COLORADO
Denver The Electric Service & Eng. Co.

CONNECTICUT
Bridgeport Electric Auto Service & Supply Co.
Hartford Robt. R. Ashwell.
New Haven The New Haven Elec. Co.

DISTRICT OF COLUMBIA
Washington Miller-Dudley Co.

DELAWARE
Wilmington Storage Battery Co.

FLORIDA
Miami Ward Eng. & Battery Co.
Jacksonville Ward Eng. & Battery Co.

GEORGIA
Atlanta Paul D. O'Kelley Company.

IDaho
Boise Western Ignition & Battery Co.

ILLINOIS
Chicago Pellet Magneto Co.
Decatur Decatur Battery Service Sta.
Dixon Auto Electrical Service Station.
Peoria Electrical Testing Co.
Springfield Chapin Elec. Garage.

INDIANA
Elkhart Auto Specialties Co.
Evansville Sieffert Brothers.
Fort Wayne Nil & Herman.
Indianapolis H. T. Electric Co.
Terre Haute J. S. Cox.
Vincennes Meyer's Garage.

IOWA
Cedar Falls Noble & Kingman.
Cedar Rapids Monroe Battery Co.
Davenport Emels Mfg. Co.
Des Moines Clyde & McNamara.
Fort Dodge Iowa Service Station.
Jefferson W. H. Hamilton.
Keokuk Feokuk Elec. & Battery Co.
Sioux City Arthur Electric Service Co.

KANSAS
Topeka Keele Electric Co.
Wichita The E. S. Cowie Elec. Co.
Arkansas City Mears Brothers.

KENTUCKY
Louisville Rommel-Smith Motor Co.

MASSACHUSETTS

Boston The Elsner-Lenk Co.
Fall River J. W. & J. H. Isherwood & Co.
Salem Alexander Michaud.
Springfield Krohne's Service Station.
Worcester Jenkins & Robinson.

MICHIGAN
Detroit Auto Electric & Service Corp.
Grand Rapids Leon. S. Heth Company.

MINNESOTA
Minneapolis Reinhard Bros. Co., Inc.

MISSOURI
Kansas City The E. S. Cowie Elec. Co.
St. Louis S. G. Hoffman Magneto Co.

MONTANA
Butte McGraw Service Shop.

NEBRASKA
Lincoln Randall & Noll.
Nebraska City Randall & Noll.
Omaha Auto Electric Service Co.

NEVADA
Reno Brown & Milberry.

NEW JERSEY
Hoboken Bijur Motor Appliance Co.
Newark P. J. Durham Co., Inc.

NEW HAMPSHIRE
Manchester Ernest E. Austin.

NEW MEXICO
Albuquerque The McClosky Automobile Co.
Deming Deming Storage Battery Co.

NEW YORK
Albany Auto Electric Equip. & Repair Co.
Amsterdam A. A. Sealey, Jr.
Binghamton Elco Engineering Co.
Brooklyn P. J. Durham Co., Inc.
Buffalo Meinhard Auto Service & Supply Co.

Elmira P. J. Durham Co., Inc.
New York City E. R. Pease.
Poughkeepsie Starter & Ignition Service Co.
Rochester A. A. Sealey, Jr.
Schenectady E. Q. Williams.
Syracuse A. A. Sealey, Jr.
Troy Stiefvater Elec. Co.
Utica

NORTH CAROLINA
Asheville Asheville Battery Co.

NORTH DAKOTA
Fargo Fargo Plumbing & Heating Co.

OHIO
Akron A. M. Allen Co.
Canton The Canton Eng. & Elec. Co.
Cincinnati Boyle Engineering Co.
Cleveland Bissinger Magneto Co.
Columbus Bissinger Magneto Co.
Dayton L. C. R. Storage Battery Co.
Toledo Elec. Power Maintenance Co.
Tiffin Electrical Service Station.
Springfield National Elec. Co.
Wooster Larwill's Service Garage.

OKLAHOMA

Oklahoma City Walsh & Johnson.
Tulsa Underwood's Magneto Exchange.

OREGON
Pendleton Wm. R. Chase Eng. Co.
Portland Sunset Electric Co.

PENNSYLVANIA
Allentown Auto Electric Co.
East Liberty Doubleday-Hill Elec. Co.
(Pittsburgh)
Lancaster Auto Equip. & Service Co.
Philadelphia Reed Automotive Service.
Uniontown

RHODE ISLAND
Providence American Ball Co.

SOUTH CAROLINA
Charleston Gas Engine & Elec. Co.
Columbia Auto Electric Co.

TENNESSEE
Knoxville McNutt & Co.
Memphis Bluff City Elec. Co.
Nashville Norman Battery Service.

TEXAS
El Paso Western Battery & Magneto Co.
Dallas Texas Ignition & Starter Co.
Houston Hurlburt-Still Elec. Co.
San Angelo Ragsdale Auto Supply Co.
San Antonio S. X. Callahan.
Fort Worth Starter Service Co.

UTAH
Salt Lake City Edwards-Warden Motor Parts Co.

VIRGINIA
Norfolk Reliance Elec. Co.
Richmond Southern Auto Repair Co., Inc.

WASHINGTON
Seattle Sunset Elec. Co.
Spokane Wm. E. Chase Eng. Co.
Yakima Wm. E. Chase Eng. Co.
Wenatchee Electric Supply Co.

WEST VIRGINIA
Wheeling McKelvey-Ewing Electrical Co.

WISCONSIN
Kenosha Auto Service Co.
Oshkosh Langstadt-Meyer Co.
Madison Madison Battery & Service Co.
Milwaukee Wisconsin Magneto Exchange.

FOREIGN

CANADA
Montreal, Que. Fehr Bros.
Toronto, Ont. Canadian Storage Battery Co.
Winnipeg, Sas. Michael Ert, Ltd.

ENGLAND
London, W. Duncan Watson Co.

AUSTRALIA
Adelaide Duncan & Fraser, Ltd.

SOUTH AFRICA
East London Evans & Co., Ltd.

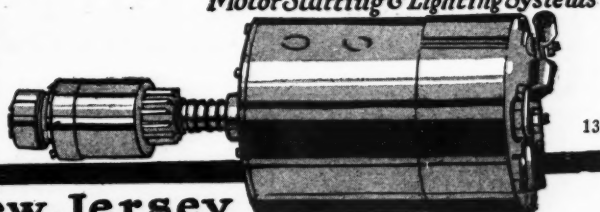
NEW ZEALAND
Wairua, H. B. H. B. Marsh, P. O. Box No. 41

Bijur Motor Appliance Company

Hoboken

New Jersey

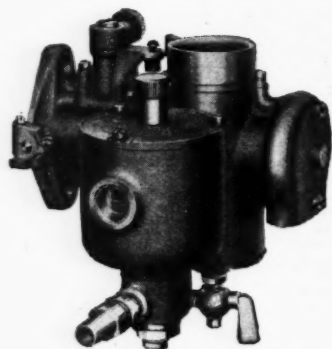
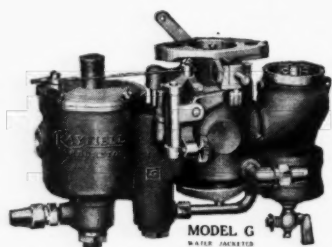
Motor Starting & Lighting Systems



RAYFIELD

CARBURETORS

Confidence in Rayfield Carburetors Based On Sound Principles of Design



Rayfield Carburetors are obtained by many years of experience, not by chance.

THAT both dealers and motorists have absolute confidence in the superiority of Rayfield carburetor performance is indicated by its choice by engineers for high grade cars.

This confidence is based on the knowledge that the principles embodied in the design and construction of Rayfield carburetors are correct. The material and workmanship are of the best.

It costs more to build such carburetors, but they are worth it. Dealers know that they are safe in recommending Rayfields to their customers. No matter whether it is the water-jacketed model G, the Model M designed for motors requiring side-outlet carburetors, or any other of the Rayfield models, the same basic principles of design apply assuring consistent performance.

The strong position we hold with both manufacturers and dealers reflects the insistent demand for a GOOD carburetor.

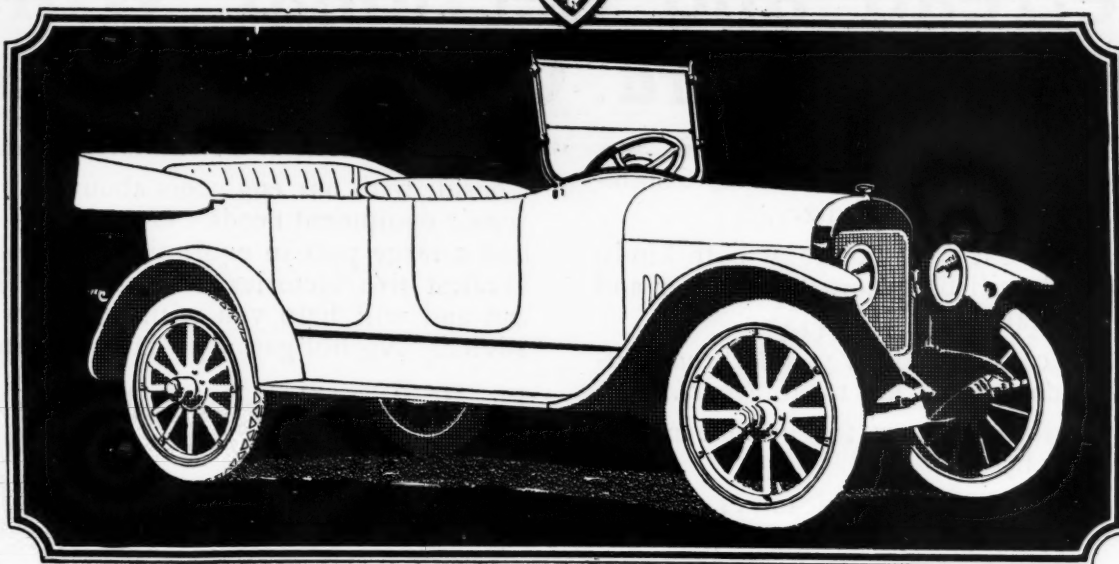
Distributors and Service Stations everywhere.

*Specified for Efficiency
—Not bought on Price*

Beneke & Kropf Manufacturing Co.

Successors to Findeisen & Kropf Mfg. Co.

21st and Rockwell Streets,
CHICAGO ILLINOIS



The Record of Car 8576

Crow-Elkhart Motor Car No. 8576, owned in Chicago, has been driven four summers, has covered about 40,000 miles, and is still rendering flawless service. This is not an isolated example. It is merely a record representative of many Crow-Elkharts now in their fourth, fifth, and sixth years. The excellence of Crow-Elkhart materials, design, and workmanship is positive assurance of long motor life and service on the road.

CROW-ELKHART Multi-Powered

Crow-Elkhart Six 5-Pass. Touring, \$1295; Six 2-Pass. Roadster, \$1295; Six 5-Pass. DeLuxe Tourster, \$1355; Six 4-Pass. DeLuxe Roadster, \$1355; Crow-Elkhart Four 5-Pass. Touring, \$1145. Four 2-Pass. Roadster, \$1145; Four 5-Pass. DeLuxe Tourster, \$1205; Four 4-Pass. DeLuxe Roadster, \$1205; 1920 Six 5-Pass. Touring Car, \$1445.

WRITE FOR CATALOG CONTAINING FULL INFORMATION

CROW-ELKHART MOTOR CORPORATION, Dept. 101, ELKHART, INDIANA
Export Department, Broadway at 53rd St., New York City, U. S. A.

DEALERS will immediately recognize the new opportunity that the Crow-Elkhart Multi-Powered Line offers. Desirable territory still open. Write today for particulars about our attractive dealer franchise.

Retread and Sectional Work On This "Third Circle" Retreader

You can cure both your retread and sectional jobs on the Akron-Williams Combination Retreading Vulcanizer.

You'll turn out A-1 repairs of both kinds. Your work will be easier, faster, surer and more profitable.

And you can depend on your Akron-Williams machines to stand up for years.

Buy repair machinery for permanence as well as for better work.

One Akron-Williams vulcanizer can be added to from time to time until you have

a complete Akron-Williams repair plant.

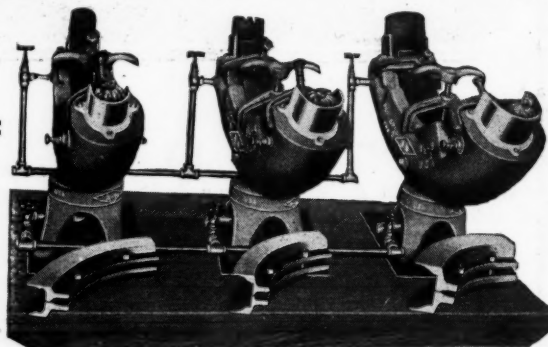
Consult with our engineers about your tire repair equipment needs. Our experts have had a large part in equipping some of the greatest tire factories in America. They can and will help you with good business advice. No obligation to buy. Write us.

The Williams Foundry & Machine Co.

Everything in Tire Repair Machinery and Tools

Akron

Ohio



Here is a battery of Akron-Williams Combination Retreading Vulcanizers, One-Third Circle, piped for separate steam. If your present steam supply will take care of three additional molds, this is the battery you should use. With these three vulcanizers you can handle all retreading and sectional work on automobile tires from 2½ inches to 5 inches. Start with one of them and increase the number as your business grows.

The Akron-Williams "Third Circle" Retreader

Built on the foundation of experience gained in equipping the largest tire factories in the world, this Akron-Williams One-Third Circle Vulcanizer saves work, saves material and turns out a better repair job. Each outfit includes crucible steel bead molds for the sectional work. Extension plates at end of vulcanizer release pressure gradually out to extreme points. Semi-curing process makes possible a perfect finish at third circle laps.

Two styles, one with steam generator in base, the other equipped to take steam from your present supply. Tubular boiler in steam generating type. Gas or gasoline fuel. Three sizes: 2½-3 in., 3½-4 in., 4½-5 in. tires.

Akron-Williams

TIRE REPAIR EQUIPMENT

When Writing to Advertisers Please Mention Motor Age

JORDAN ARROW

The Striking Story of the JORDAN *Silhouette*

By Edward S. Jordan

TELL us the inside story of the Jordan Silhouette? And the Playboy? What suggested the idea? Where did you get the names? Who made those remarkable illustrations? How many hundreds of inquiries did you get?

In scores of flattering letters and telegrams, our friends are asking these and many other questions in an apparent effort to make us believe that the sales and advertising presentation of the new Jordan models was a most remarkable exhibition of what can be done with a dominant idea, if it is in tune with the spirit of the

W. B. Riley
Sales Manager



times and in keeping with the public demand. Of course, we have had a lot of fun doing it. Every man and woman in the Jordan organization is happy as a result.

Engineers dream of building a perfectly balanced motor car—Russell Begg has come very near to this realization.

Artists dream of producing a wonderful picture which will excel anything previously done — Charles Daniel Frey produced those illustrations which startled the advertising world. Salesmen dream of many buyers coming in the door — Jordan salesmen have experienced this joy. Sales Managers love to think of piles of orders coming by mail and wire — William B. Riley isn't so happy now. He is hoarse from explaining, long distance, that he can't deliver for weeks to come.



Here is Russell Begg (on the right,) with Carl Landane, who builds model cars for Jordan

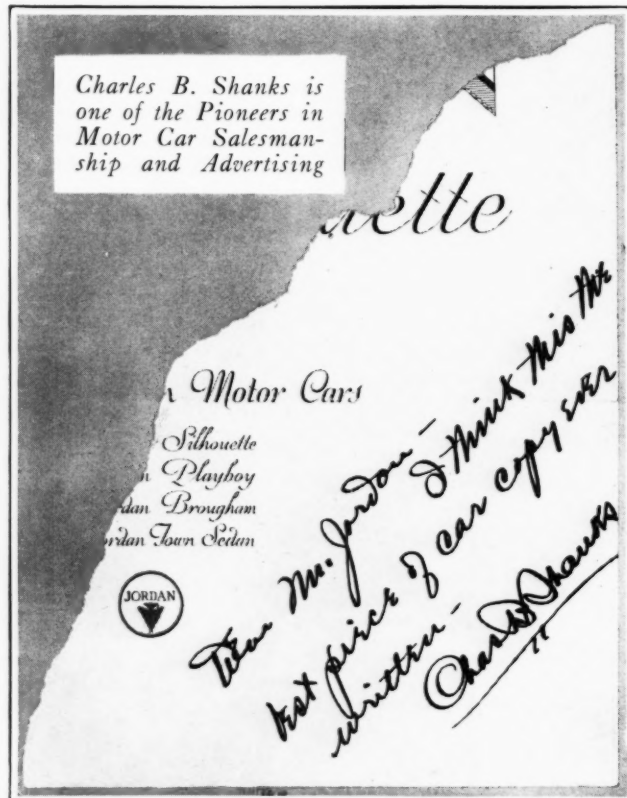
But it's a great life, so I will tell you the inside story.

How the Silhouette Happened

PEOPLE are gifted with six senses — five that are commonly known — the sixth is equilibrium or balance, and doctors say this sense is governed by little canals in the ear. The first sense is sight. We knew people were growing weary of motor cars that looked like all the rest. The bevel edge body was becoming painful through common imitation.

Styles travel with the sun, from east to west. So we went to Paris for an idea. Three points make or break a body design — the dash, the seat cowl and the height. The secret of the remainder is in door shapes, mouldings and appointments.

The second sense is feeling. It's in the leather, the Marshall cushion springs, the balanced



chassis, the all-vanadium steel springs, the arrangement of the seats and the tilt of cushions.

Taste and atmosphere are in the appointments, the cut of the top, the boot and saddle bag, the rugs, the rear glass, the fenders, the instrument board, the curtains and the little details.

The sense of hearing must never be offended. Conspicuous noises have lost many a sale. Russell Begg adopted a rattle-proof spring shackle to eliminate the noise bugaboo, so common in many cars.

The secret of Jordan service is balance. That is what keeps the Jordan out of the repair shop. Russell Begg, when he designed the Jordan, laid out the best-balanced chassis in America. The Jordan goes forward — not sideways. Think it over!

So we labored long to produce a car that would please the owner who had gone through the kindergarten with his first car, known grade school experience with his second, or third, and was ready for the high school.

How the Name Suggested Itself

ONE night I came in with Begg from Uniontown — plastered with mud, but happy. We had been trying the new car on the toughest mountain in Pennsylvania. When in Uniontown, your state of mind is that of a fly climbing out of a milk pitcher. There are no level spots. You go up or you go down. We have never advertised Jordan performance. The owners do that. Our belief is that a car simply must perform well. Our advertising is

The Mather Spring Company
Manufacturers of
Automobile Springs

Toledo, O. U.S.A. April 26, 1919.

Dear Ned:

The Old Thesaurus would have to be dug up in order to find adequate synonym; so I will stick to Second Reader words and say it is the superlative of great.

Just an authoritative additional word: Adelaide says: "The Jordan Second Reader will sell Jordan cars."

Sincerely,

Brownie

Edward S. Jordan,
Cleveland,
Ohio.

Let the old gentleman rest, Brownie, we don't need him

intended to induce people, first to inspect the car, and then ride in it. The performance is so pleasing that owners are inclined to exaggerate it. If we claimed a lot, they would be inclined to depreciate it.

My boy Jack, wanted to know how she took the hill — and what we would name it.

I jokingly told him the name would include the letter "S" — the most suggestive, striking, subtle, simple, smoothest letter in the alphabet. To a twelve-year old, that was interesting. So I took the dictionary and pointed out to him many interesting words, in which the letter "S" appears — sleep — slumber — swift — speed — sweetheart — siren — stars — sun — song and many more.

Just for fun, I told him I could write a poem of twelve lines in which the letter "S" would appear more often than any other.

He grinned and said, "I bet you can't"—Here it is: The name "Silhouette" was thus suggested and adopted.

The Subtle Sound of "S"

Strikingly suggestive is the subtle sound of **S**
The beginning and the ending of the magic word **S**uccess
Symbol of the sunny south, sleep and starry skies
If we didn't have this letter, how could we advertise
In **S**ilhouette and sunlight its syncopated swing
Inspires the copy writer to almost anything

Spirit of the seven seas, siren song of spring
Reveling o'er the sleeping roads, youth will have its fling
Swift as speeding swallow, sinews of the stag
A little touch of genius, the boot and saddle bag
A strangely singing letter—but now we must confess
Our middle name ain't **S**amuel—it's just the letter **S**.

*Think over some of the advertising successes of the past and you will recall some in which the letter "S" prominently appeared.
How easily Sapolio rolls off the tongue, or Sunny Jim*

How We Have Fun In Our Business

SOME of the fellows seem to think we have a lot of fun in our business. We do because we tremendously enjoy it. In fact, it's the greatest business in the world.

Mitch Thorsen, publisher of the *Cosmopolitan* is one of these. When he read the Playboy advertising copy, he said he got an inspiration. So he and "Pit," one of the live wires in his organization got up a folder in which they printed "The Tale of the Playboy." It's a real poem. See if you don't think so.

Now About the Playboy

HOW about the Playboy? Why, the truth is — if Kaiser Bill hadn't quit, the name would have been Doughboy.

Five family factors must be considered in building a motor car. Father thinks in terms of the pay-roll or economy. Mother thinks of

Cosmopolitan

119 WEST FORTIETH STREET, NEW YORK

April 23, 1919.

Dear Ned:

The Playboy copy made a hit with me.

I told you at dinner the other night that I would give you tangible evidence of the inspiration the Playboy gave me. I had in mind putting it up to Pitkin, who is one of my associates - and "The Tale of the Playboy" herewith is the result.

Pit had a lot of fun writing it, and I had a lot of fun reading it, and a lot more fun sending it on to you to read.

Faithfully yours,

J Mitchel Thorsen-H

Mitch

No question Mitch—it's a lot of fun

The Tale of the Playboy

YOU'VE heard, or maybe you haven't heard, but the secret is out, it seems,
How Jordan has built his Playboy of glory and steel and dreams,
Built for the joy of the building, and the joy of building true,
A brawny thing, and a graceful thing, for the sweep o' the Avenue;
There's a savor of links about it, of laughter and lilt and light,—
There's a hint of old loves and boxing gloves, and folly and faith and fight!
It's a shame to call it a roadster — so full is its thoroughbred frame,
Of boyhood and mirth and morning, and the cross of wild and tame.
It's built for a man's man, certain! And it's built for the lass whose face
Is brown with the sun when the day is done of revel and romp and race.
And whether in cockpit swanky aft, or in leather comfort fore,
You'll breathe more deep at the forward sweep, and the glorious thunder-roar
As you loosen the jaws of the cut-out and hark to the voice of Thor.

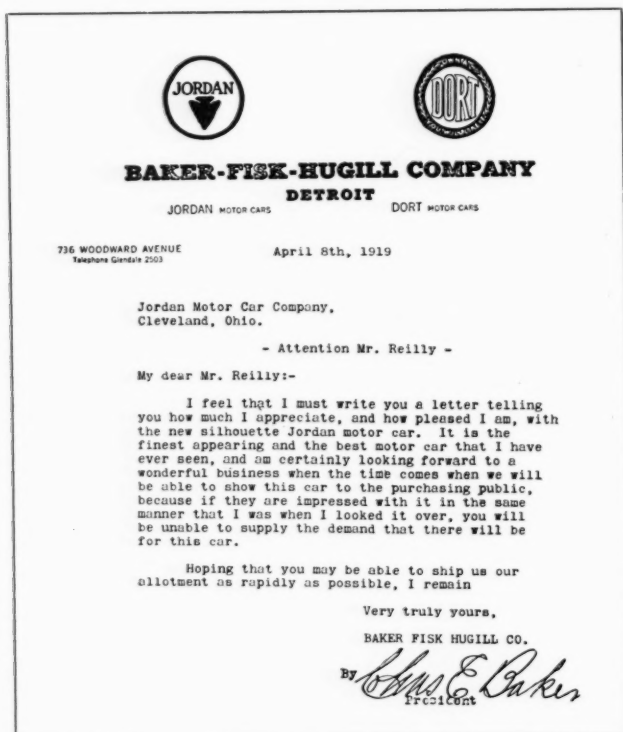
—and how that tale will be read.

TONIGHT, in the quiet of home-time, in the land of your heart's desire,
As you lounge in your sleepy-hollow chair, and draw on the rare old brier —
With the folk of your heart about you, and — sh! — from the music-room
A rare old Gaelic melody finds its way thru the stately gloom,—
Perhaps you will know, as never before, the glory of love and life;
Perhaps you will know that, weal or woe, sorrow or joy or strife,
It's good to live and it's good to give and it's good to cram the days
With all of the joys of living, in all of the master ways
That man has wrought with toil and thought, from the sea and the earth and air —
Perhaps the tale of the Playboy will call to the boy in you
As a certain pond and a hook and line and a mongrel used to do!

*Inspired by the Playboy and inscribed to
E. S. JORDAN by J. MITCHEL THORSEN.*

*Written by "Pit" of Cosmopolitan
"America's Greatest Magazine"*

JORDAN



A letter from Charles E. Baker, Detroit distributor for Jordan

her children's opportunity. Daughter thinks of her position in life and a happy marriage. Son thinks of travel, speed, pep, get-up-and-go. Then there is a pet in every family.

Two million wonderful girls have been waiting for two million wonderful boys. There will be a host of weddings in June. The boys who went across to work for democracy are entitled to a little play.

The Playboy is ready for delivery now.

The Mystery of the Silhouette

THE first inkling the public was given of the new models was in a mysterious insert in the trade papers. Some people think the public, or people outside the trade, do not read the motor trade papers. The result of this advertisement was striking.

Of course everyone in the trade made a guess. Many were sure they recognized the wording of Jordan copy. They did and it was intended they should.

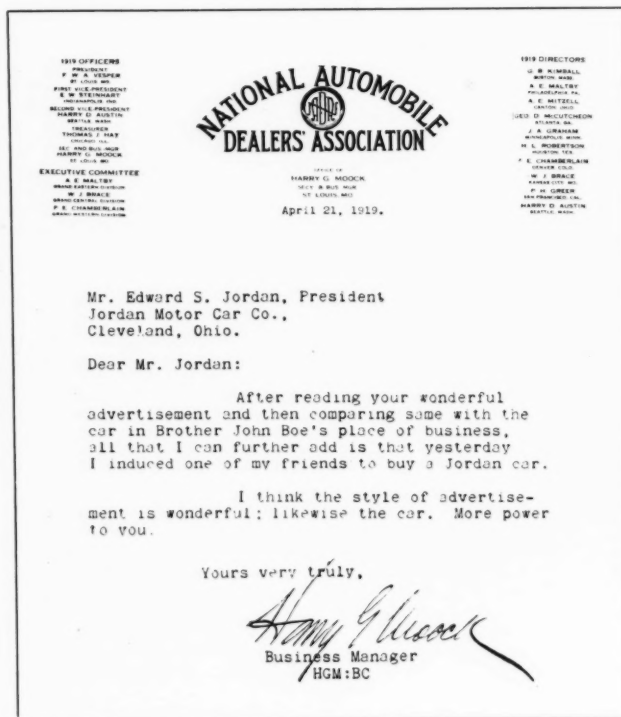
Others not familiar with the following phrase (a chassis of finished mechanical excellence) attributed the advertising to other manufacturers, and it is significant that many guessed the Silhouette to be a product above \$3,000 in price.

Jordan dealers were in the secret. They had the new cars hidden, ready for display on the day the announcement appeared in *The Saturday Evening Post* and *Literary Digest*.

Then the orders began to come.

It means little to give actual numbers.

Thirteen hundred orders were received in the first ten days and while Jordan production is



This is what Harry G. Mook, Business Manager of the N. A. D. A. did when he read the Advertising

limited, they have been coming at the rate of about forty daily ever since.

Of course, many will be disappointed, but Jordan plans for increased production are moving forward rapidly.

Why People Swamped Us With Orders

EVERY day someone asks why people have been so strongly attracted to the Jordan car. Is there anything magic about it?

There is nothing magic about it. It is simply an honest car, that will stand up and give service to the owner over a long period of time, with little expense and worry to him.

But you say — there are other cars that will do the same. The answer is — they cost much more than the Jordan.

That sounds like something you have heard before. You are not convinced.

Let us proceed by illustration.

The fastest selling car in the world is built by a man who for many years had no competition. Why? Because he first built a car for the other fellow. Other makers were building cars which they liked to ride in themselves.

The man who had grown tired of walking, riding on a bicycle, or crowding into a street car, bought this car, as soon as his savings warranted.

There are fifteen million people who can buy in this class.

Now, you will grant that man loves comfort and the satisfaction of his senses.

When he makes enough money he takes the next social step — he buys a larger, better car, costing a few hundred dollars more. That explains the big success of another manufacturer, who usually puts three strong points into his advertising — his good honest name — low gasoline consumption, and high tire mileage. The price of his product is not featured. People believe his product is right, and most intelligent people are suspicious of price merchandising. Therefore, he sells to thousands who might easily afford to pay more. Remember—his purpose is to honestly

serve the public.

Seven million people can afford a car in his class.

Now, every man who has a family, knows that women and children like to entertain friends, and all human beings love reserve power. A certain car which first gratified this demand leads in the next class. So when a man is ready for the next social step, he buys a car in this class. Income statistics prove there is a market for one million cars in that field.

The three cars referred to are produced in tremendous quantities and are built to



The Mystery of the Jordan Silhouette



Just read the Jordan
Silhouette Ad in the last Saturday
Evening Post.

Made a bet with myself
that no ordinary writer ever wrote
that "full of the spirit of victory,
29 louvres stuff."

If he did, I want to pay the bet - so come across with the answer, wasn't it your own little fountain pen dipped in your own heart's blood?

Yours in admiration,

331 modern are up *of mistake*

J. T. H. Mitchell knows more about advertising than an eagle knows about aviation. He knows how he does it

serve a human need without attempting to completely satisfy all human demands.

The day arrives when the family income entitles its members to more of the good things of life. A hedge around the yard — a new coat of paint for the present house, or possibly a new home, distinctive in appearance, a new piano, Victrola, heating system, or possibly a college for the boy or girl.

When that day comes, that family chooses a car like the Jordan, rare in beauty, excellent in finish, distinguished by comfort, good taste, absence of conspicuous noises, and trade marked with a good name.

But — why doesn't every one in this class buy a car like the Jordan?

Because, hope springs eternal in the human breast. Boys and girls dream of magic. Sales experts know that some dealers do the same thing. They are always hoping that someone will produce a motor, an axle, or some feature that will revolutionize the industry. When

someone announces that this has been done, they rush madly to buy, hoping that it has at last been accomplished.

The leading manufacturers in the industry have never taken advantage of this human weakness, because they are not dazzled by the idea of making money rapidly.

Many people confuse the idea of happiness with the idea of making money. The most envied manufacturers in this business have learned that happiness lies in serving others, not magically, but creditably.

Many people get the idea that if a man is making money he is a success. No man is a success until he does something of which his children may be proud and that something must be creditable, or he will be secretly unhappy.

There is nothing magic about a good motor car. Like a good man or a good woman, it has character. If it possesses good character, it will possess a good name and people will buy it without question.

Thus all the problems of production, sales and advertising, are solved. The manufacturer succeeds — the dealer and salesmen succeed — the public is served.

Everybody is happy — and that is Success.

Form 120A

CLASS OF SERVICE SYMBOL	TO	FROM	MESSAGE
Telegram			
Day Letter	Blue		
Night Message	Blue		
Night Letter	Bl.		

If none of these three symbols appears after the check number of words, this is a Telegram. Otherwise, the telephone is indicated by the symbol appearing after the check.

WESTERN UNION
TELEGRAM

NEWCOMB CARLTON, PRESIDENT GEORGE W. ATKINS, FIRST VICE-PRESIDENT

RECEIVED AT ROSE BUILDING, 2040 EAST 9th ST., CLEVELAND

1919 Mar. 29, PM 7 36

596 G 12

A Py PITTSBURGH PENN 725 P 29

Edward S. Jordan

President Jordan Motor Car Co., Cleveland, O.

I congratulate you and your Aces Miss Silhouette and Escent Play Boy.

Robert F. McDurdy

Robert P. McCurdy of Pittsburgh, Philadelphia and New York suggested the roadster as a spring member of the Jordan line

JORDAN MOTOR CAR COMPANY, CLEVELAND, OHIO

Make Big Money Selling Anchor Tops

Write Today for Our Agency Plan

THIS year Anchor Top Dealers will make more money than ever before. Here is why:

Each year fewer motor car owners are willing to be deprived of the use of their car simply because of bad weather. That is the time when a car is wanted and needed most of all.

Nor are they willing to depend on side curtains. Besides being unsightly and bothersome, they are but poor protection against snow, sleet, wind and cold. The "flu" epidemic last year will make all more careful of their health this year.

Anchor Tops are the answer. They transform an open car into a fine closed car, that means perfect comfort and safety in any weather. The dome light, handsome whipcord lining, snug fitting doors and windows are but a few of the touches that make these tops "sell on sight."

There are now twenty models of Anchor Tops for the following cars:

Buick	Ford	Willys-Knight	Overland
Essex	Dodge	Chevrolet	

Being specially designed for these cars, an Anchor Top fits right on the body irons of the car. The top is light in weight, rigid and will outlast the car itself. No rattling, no squeaking, no overhanging. Anchor Tops are the creations of master coach builders.

Every open car in your community is an Anchor Top prospect. Think what that means! Surely you aren't going to let someone else get this SURE business.

But remember our output is limited. Last year we were unable to fill all the orders. We urge you therefore to send in the coupon today for prices, photo prints and full details regarding our agency proposition. Clip the coupon NOW, and send it to us.

THE ANCHOR TOP & BODY CO.

301 S. Main Street
Cincinnati, Ohio

*Fine Coach Builders
for 30 Years*

The
Anchor
Top &
Body Co.
301 S Main
Street
Cincinnati,
Ohio

Without incurring obligation I would like to see photo-prints and prices of Anchor Tops. Also full information regarding your agency proposition.

FOR PHOTO-PRINTS AND PRICES

Name.....

Address.....

I sell the following makes of cars:



Brunswick TIRES

The Choice of Men Who Know Quality

THE experienced driver, the man who knows tires by tests and comparisons, best appreciates the merits of Brunswicks. He realizes that tire quality depends on the standards and principles of the maker.

The House of Brunswick won success in many fields of production by giving all that it was possible to give. A narrow margin of profit made possible the highest quality and brought far greater sales. The tremendous selling-organization developed through 74 years of manufacture saved on the cost.

Tires are not built by secret processes. It is a question of workmanship and choice of materials. The Brunswick Tire you buy is the best that money, research and experience can make it. A corps of experts is constantly striving to build still better tires. Every Brunswick must meet their severe standards of excellence before it leaves the factory.

Put a Brunswick to any test you wish. Examine the fabric and other materials in a laboratory. This has already been done by us before it reaches you. Study its construction. You will find that it combines every known tire feature.

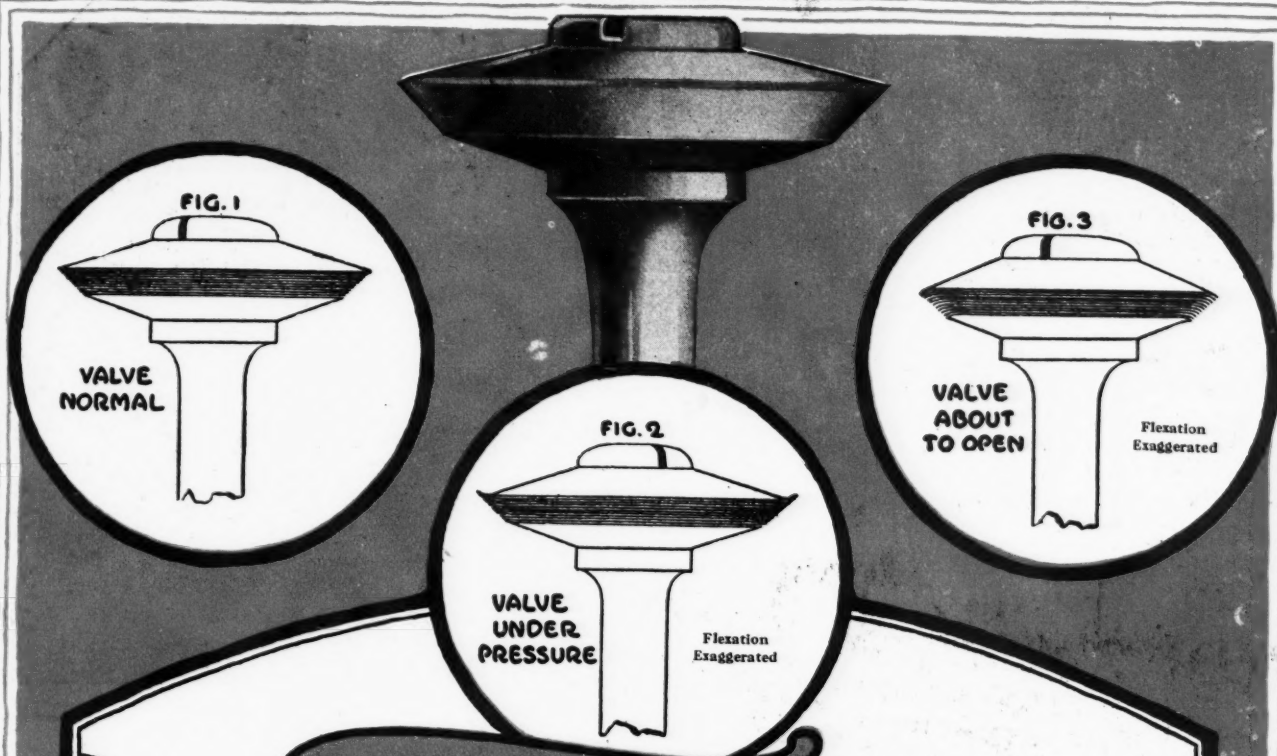
Then test it on the road, by actual use. Note its record for durability and resiliency. You'll want all Brunswicks.

These sound, enduring tires cost no more than others. For it is logical that The House of Brunswick can stand a higher manufacturing cost than that of other concerns selling tires at equal prices.

Brunswick Dealers can supply you with cord and fabric tires in a variety of treads. Choose the one that suits you best. All will give more mileage than you are used to.

There's a Brunswick Tire for every car.

The Brunswick-Balke-Collender Co., General Offices: 623-633 S. Wabash Ave., Chicago
Branches in the Principal Cities of the United States and Canada



Flexedge

SELF-SEATING
LAMINATED VALVES

Sensible-Logical-Inevitable

A Valve Seat Carbon Remover at Work While You Drive

Mr. Dealer:—

Remember the last time you had the valves ground in your own car, how powerful your motor was? Why, all you had to do was just lay your foot up against that accelerator, and, oh! boy! how she would step out. Then you probably also remember later, when you had to tease that same motor "to pick up," without getting into low gear. Valve-carbon—without it, driving is a pleasure—with it, a disappointment.

Flexedge Self-Seating Valves Do Away With Valve Grinding

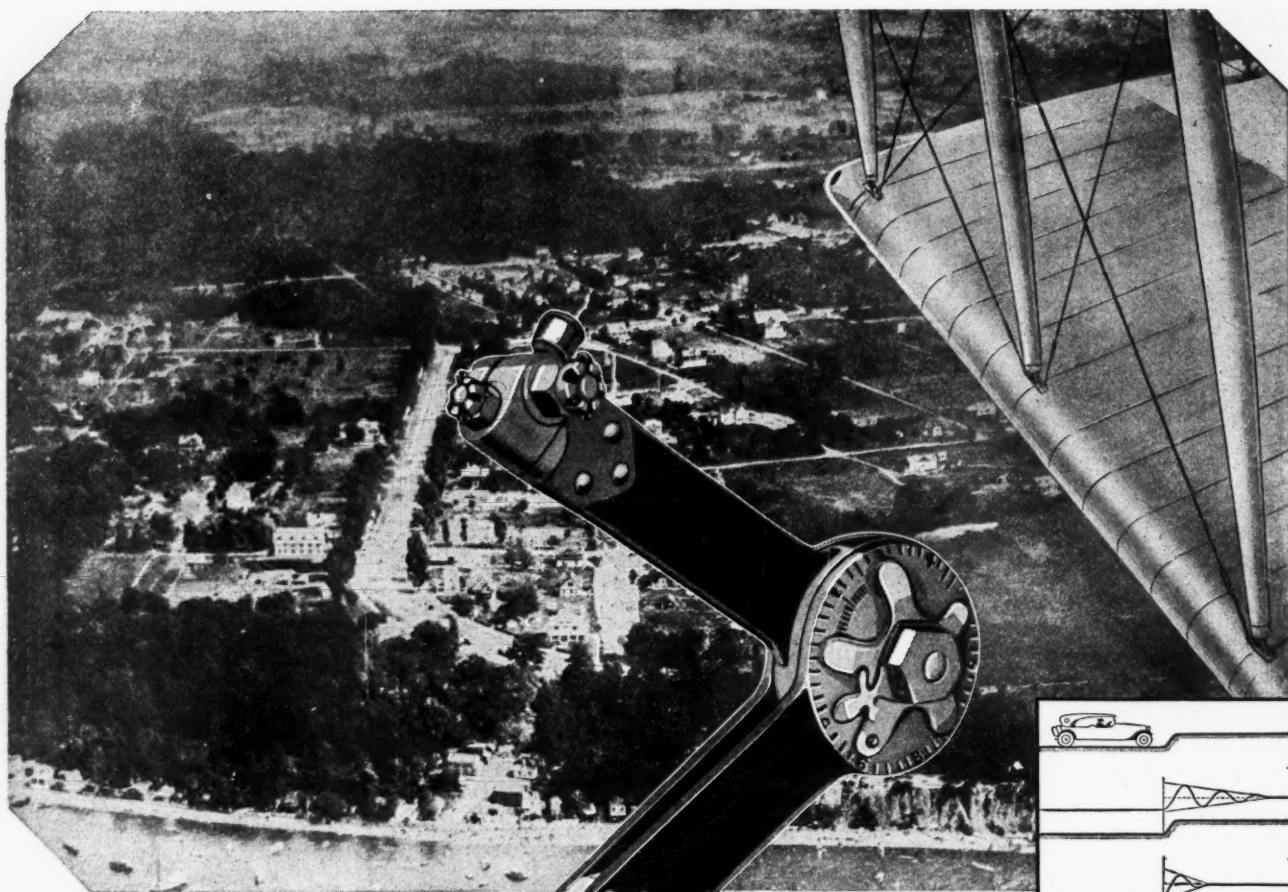
Gently, but continuously, they scrape the seat, keeping the metal clean and bright. They are rigid enough to last as long as the motor they are used in—resilient enough to curve slightly upward at the edges when under the explosion pressure and to droop slightly when the cam strikes its powerful blow on the push rod. Their entire flexation is so small as to measure only a tiny fraction of a thousandth part of an inch, scarcely enough to be called a vibration, yet sufficient to remove the tiny flecks of carbon which collect after each explosion and soon build up into dangerous pitting deposits. Flexedge Self-Seating Valves are installed just like other valves.

DEALERS—All you have to say is, "No more valve grinding"—and you have made the sale. Give your favorite jobber a trial order—guaranteed to satisfy. They sell quickly.

JOBBERS—Write for facts concerning this BIG SELLER.

Self-Seating Valve Co.

Harvey, Illinois



*All roads look smooth
from the Aeroplane*

*All roads seem
smooth to the car
equipped with the*

Hartford

SHOCK ABSORBER

IT is a real experience to ride in a Hartford equipped car. You glide along so smoothly and evenly that every road seems transformed into a level boulevard. But how is that possible?—a fair question that deserves a fair answer:

You probably know what the springs of your car are up against. How it is impossible to so design them that they will take care of every change in road surface—every change in speed—and every road difficulty—without transmitting the shock to the car and to you. Springs must have help if your car is to ride smoothly.

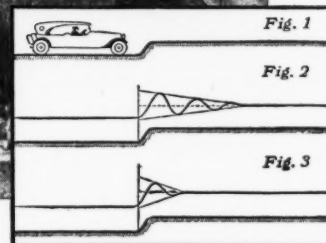
The most nearly perfect of all springs-helps is the Hartford Shock Absorber. These precision-made shock

absorbers soften and gently regulate the springs on compression and expansion. They subdue the harmful vibrations caused by jolts and jars, thus saving wear and tear on all parts of the car and protecting the passengers.

The Hartford theory has been approved by most of America's leading automobile manufacturers:

Apperson	Daniels	McFarlan	Owen-Magnetic
Biddle	F. R. P.	Mercer	Pierce-Arrow
Cole	Haynes	Murray	Premier Revere
Crawford	Marmon	National	Singer Stutz

There can be no stronger proof of Hartford superiority than the plain fact that a majority of America's best cars are factory-equipped with Hartford Shock Absorbers. And our thousands of friends who have equipped their own cars with Hartfords are enthusiastic in praising the luxury and long life Hartfords have added to their cars.



How it Works:

Fig. 1—Automobile approaching road bump.

Fig. 2—Movement of car body when car not equipped with Hartfords meets bump.

Fig. 3—Movement of car body when car equipped with Hartfords meets bump. Note how the Hartfords dampen the vibrations, saving you from discomfort and protecting your car.

There is a special model made for your car. Ask the man who sold it to you to put on a trial set of Hartfords. Use them for thirty days—if you are not satisfied that Hartfords "make every road a boulevard" your money will be refunded. Try it today.

EDWARD V. HARTFORD, Inc., 146 Morgan Street, Jersey City, N. J

Factory Branches: BOSTON, 319-325 Columbus Avenue. CHICAGO, 1716 Michigan Avenue

BLACKHAWK

QUALITY
SERVICE FINISH

RUST-

PROOF

WRENCHES

THE BLACKHAWK line of wrenches is made for the jobber and dealer who want to build up a permanent trade on wrenches they can sell by name under a guarantee of satisfaction. They are more than ordinary wrenches—they stand at the head of wrench-making progress.

The fit of every Blackhawk wrench is scientifically correct. The sockets are machine turned from the solid steel bar and broached out. Unusually strong. Finished by the Parker rust-proof process. Individual wrenches, standard combination sets—a Blackhawk wrench for every purpose.

Write for catalog and prices.

Manufacturers: Send blue prints for estimate on wrenches to be made to specifications.

C. N. & F. W. JONAS

Representatives for

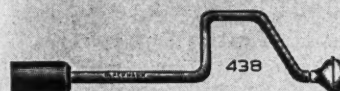
American Grinder Mfg. Co.
Milwaukee, Wis.

With offices at

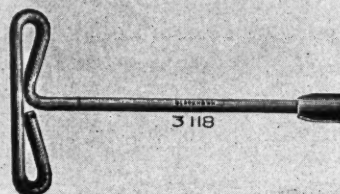
Transportation Bldg., CHICAGO; Equitable Bldg., LOS ANGELES; 111 New Montgomery St., SAN FRANCISCO; 616 Pioneer Bldg., SEATTLE.



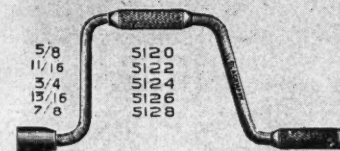
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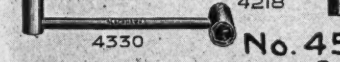
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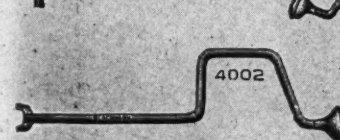


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No. 45
Ford Set



4002



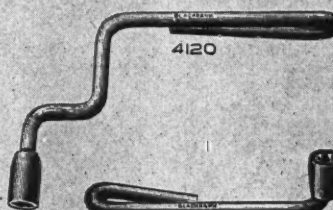
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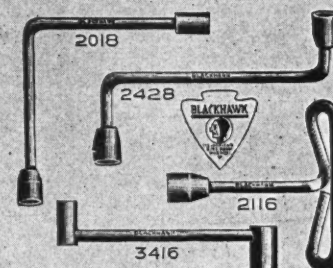
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4120



2018

2428

2116

3416

No. 30 Chevrolet Set




4122



9/16





REMILE YOUR WORN TIRES

Save 75% of your Tire Value

FORMERLY motorists had the choice of two alternatives: To run their tires on the carcass after the tread had worn off, with a blow-out as a result. Or, to depend on makeshift repairs that gave no assurance of sufficient wear to pay for the repair cost.

So for years motorists have been waiting for an answer to this problem—for a tire-remiler that would enable them to get 100 per cent value from their tires.

Now that long-awaited-for tire-remiler is here. It is the final answer to the less-tire-cost-per mile problem. It is the Miller Ad-On-A-Tire.

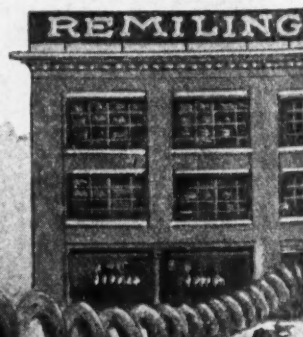
The Ad-On-A-Tire is built by the Miller Rubber Company, makers of the famous Miller Uniform, **Geared-to-the-Road** Tires.

The same uniform workmanship, finest quality materials, and efficient factory methods that have made possible Miller matchless tire uniformity have gone into the making of the Miller Ad-On-A-Tire.

The Miller Ad-On-A-Tire is built of tough, buoyant rubber. It has several layers of fabric-breaker strip, tread and side wall which completely cover the tire, and clinch under the rim. Once on, it becomes an integral part of the tire. And the Ad-On-A-Tire also has the famous **Geared-to-the-Road** Tread that assures perfect traction and safety.

With this tire-remiler you can save 75 per cent of your tire value. Carefully kept records in hundreds of cases, under the severest tests, prove this.

Don't throw away your tires after the tread is worn off. Find the Miller Ad-On-A-Tire Dealer in your city and let him remile your tires. Your worn tires will be made almost as good as new. Miller Ad-On-A-Tires assure you of a 100 per cent return on your tire money.



Miller AD-ON

A BIG OPPORTUNITY For Miller AD-ON-A-TIRE Dealers

EVERYWHERE tire repair men are awakening to the enormous money-making possibilities of remiling tires. No business today offers such guaranteed sure returns. Every motor car owner, regardless of the make of tire he prefers, is a Miller Ad-On-A-Tire prospect.

Some men prefer one make of tires—others another. But ALL realize that in the Miller Ad-On-A-Tire they have the tire-remiler that will make their old tires almost as good as new—*regardless of the make of tire they originally preferred.*

The result has been that Miller Ad-On-A-Tire Dealers everywhere are making the most astonishing profits.

Stop a moment and compute the number of motor cars in your city. Each one will this season need from 4 to 6 Miller Ad-On-A-Tires.

Think what this means to you in Ad-On-A-Tire business! In new customers who will learn to know your store and have confidence in your work and what you sell! In more business and bigger profits all down the line!

We give to our dealers a most complete agency proposition—attractive profits, and complete sales and advertising assistance, such as letterheads, newspaper advertisements, folders, wall hangers, price lists, etc. In fact everything that will enable you to get the full benefit from the wonderful Ad-On-A-Tire market is included. Absolutely no special equipment is required.

Write us today for the detailed information. Each day's delay means lost business and profits. Don't let someone else get in ahead of you. The time to get busy is right NOW. So clip out the coupon and mail it to us. Remember, to get the facts obligates you in no way.

THE MILLER RUBBER COMPANY

Dept. A198, Akron, Ohio

Makers also of Miller Uniform Geared-to-the-Road Tires and Miller Red and Gray Inner-Tubes—The Team-Mates of Uniform Tires



AD-ON-A-TIRE



CLIP THIS COUPON NOW

THE
MILLER
RUBBER
COMPANY,
Dept. A-198,
Akron, Ohio

Gentlemen: Without any obligation on my part please send me full information regarding your Ad-On-A-Tire Agency Proposition.

Your Name.....

City..... State.....

I sell the following tires.....

I do only tire repair work.....

He just bought a Ford . . .

SMITH has just bought a Ford; so has Jones. Smith's very proud of his shiny, new car, just in from Detroit, but he isn't any prouder than Jones of his 1915 model that he bought from Brown.

Throughout the country there are thousands and tens of thousands of people just like Smith and Jones; Ford owners for the first time—and all prospects for speedometers.

You have, in this era of unprecedented activity, an opportunity to handle a precision speedometer on a practical merchandising basis.

There isn't any doubt but what all these Ford owners want speedometers. When they come in to you, just hand them the package containing the Johns-Manville Speedometer complete, including an instrument board and full instructions. They can easily apply the instrument to the Ford, because it's adjustable to fit all open type bodies (there is also a special model for sedans).

Of course it's a quick seller, and there isn't any question about the quality or about your protection in any market. Your Jobber can tell you what Johns-Manville's policy means to the trade.

Price, \$12.00

Complete with Instrument Board

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities



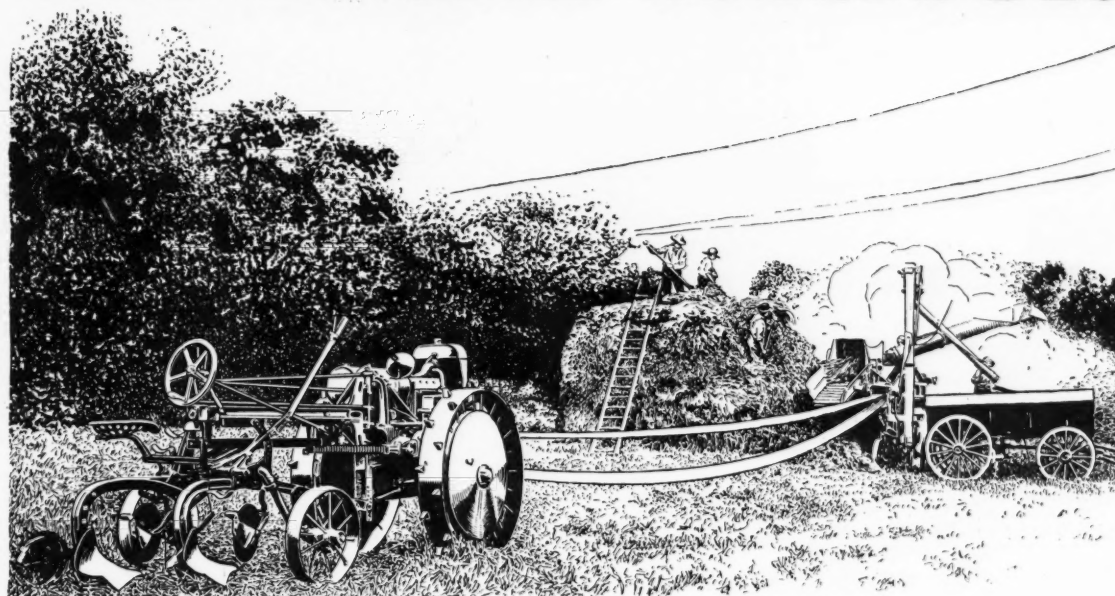
JOHNS-MANVILLE

AUTOMOTIVE EQUIPMENT

When Writing to Advertisers Please Mention Motor Age

MOLINE

UNIVERSAL TRACTOR



Satisfied Customers a Great Selling Force

It is not the one time customers that give tractor dealers their opportunity to increase their sales from year to year and put their business on a paying basis—and you will not get the repeat kind unless you give them full value for their money.

At the fore-front in modern tractor business today stands the Moline-Universal Tractor as it can be put to use through every season of the year and makes the elimination of horses possible. It gives the purchaser all year around service and does it cheaper and with less exertion. The tractor creates a demand for numerous implements that can be regularly hitched to it as a one-man outfit.

After all seasonable work has been completed, including the cultivation of corn, the Moline-Universal Tractor can be belted up to the thresher and then on through the winter can be used for other miscellaneous work.

And the Moline-Universal Tractor goes to the customer backed by Moline Service which is backed by twenty-three branch houses located in all parts of the country.

MOLINE PLOW CO. Moline, Ill.

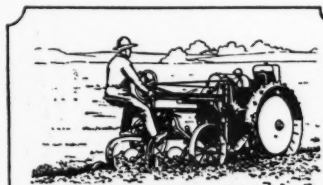
Branches At:

Atlanta
New Orleans
Dallas
Oklahoma City
St. Louis
Poughkeepsie

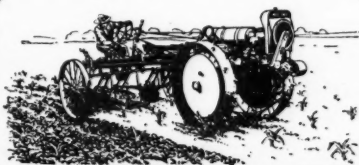
Baltimore
Los Angeles
Stockton
Spokane
Portland
Salt Lake City

Denver
Kansas City
Omaha
Minneapolis
Minot
Sioux Falls

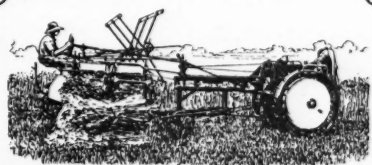
Des Moines
Bloomington, Ill.
Indianapolis
Columbus, O.
Jackson, Mich.



PLOWING



CULTIVATING



HARVESTING

*The Standard Spark
Plug of the World*



Makers of fine passenger cars and of motor trucks and tractors of established reputation have too much at stake to gamble with inferior spark plugs.

They factory-equip with AC Spark Plugs because their engineers have recommended the use of AC's after finding AC's best in exacting, competitive tests.

Merit alone is the basis for the pronounced preference so clearly shown in the accompanying list of manufacturers who have adopted AC's as original equipment.

Thousands of spark plug dealers, as well, recognize the superiorities of AC's and concentrate on the complete AC line.

They are buying their tires, their piston rings and other stocks of equipment with the same care and judgment that they

exercised in selecting AC's.

For they know that a permanent and profitable business can be built only on products of proven quality, made by sound and resourceful companies.

And in AC's they have spark plugs as good as many years of scientific experimentation and continual development can produce.

Complete dealer information on request.

Champion Ignition Company, FLINT, *Michigan*

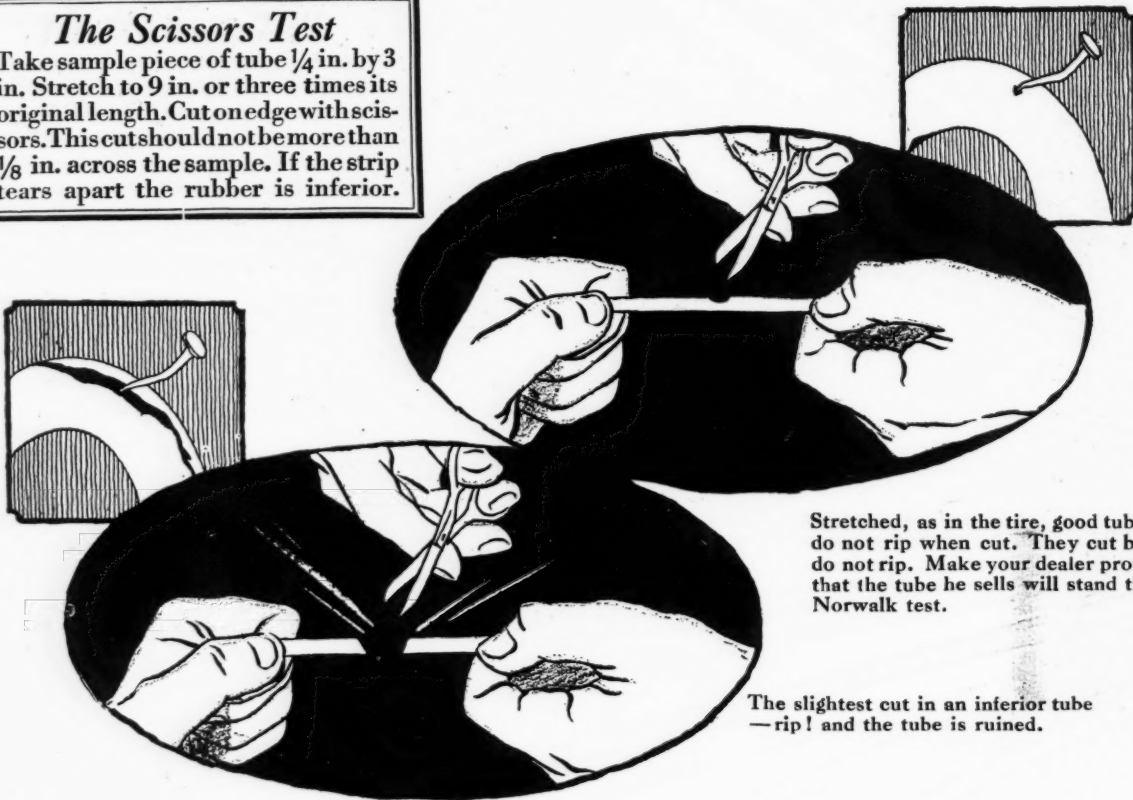
These manufacturers use AC's for factory equipment

Acason Trucks	Harvey Trucks	Paterson
Acme Trucks	Hatfield	Patriot Trucks
Advance-Rumely	Haynes	Peerless
Tractors	Herschell-Spillman	Phianna
Ahrens Fox Fire	Hispano-Suiza	Pierce-Arrow
Trucks	Howell Tractors	Pilot
American-La France	Hudson	Pioneer Tractors
American Trucks	Hupmobile	Premier
Anderson	Jackson	Reo
Apperson	Jordan	Re Vere
Appleton Tractors	Jumoo Trucks	Riker Trucks
Auburn	Kalamazoo Trucks	Robinson Fire Trucks
Avery Tractors	Kent Concrete	Rock Falls
Beck-Hawkeye	Mixers	Rowe Trucks
Trucks	Kissel Kar	Rutenber Motors
Betz Trucks	Kleiber Trucks	Samson Tractors
Brockway Trucks	Klemm Trucks	Sandow Trucks
Buffalo Motors	Knox Tractors	Saxon
Bugatti	K-Z Trucks	Scripps-Booth
Buick	La Crosse Tractors	Scripps Motors
Cadillac	Lalley-Light	Seagrave Fire Trucks
J. I. Case T. M. Co.	Liberty	Seneca
Chalmers	Liberty Aircraft	Signal Trucks
Chandler	Motors	Singer
Chevrolet	Locomobile	Smith Motor Wheel
Chicago Trucks	Marmon	Standard "8"
Cole	Master Trucks	Standard Trucks
Commonwealth	Maxim Fire Trucks	Stearns-Knight
Conestoga Trucks	Maytag	Sterling Engines
Continental Motors	McLaughlin (Canada)	Sterling Motors
Crane Simplex	Menominee Trucks	Sterling Trucks
Daniels	Midland Trucks	Stewart Trucks
Davis	Mitchell	Straubel Engines
Deere Tractors	Moline-Knight	Sullivan Trucks
Delco-Light	Moreland Trucks	Swartz Lighting
Diamond T Trucks	Napoleon Trucks	Plants
Diehl Trucks	Nash	S-S-E-Co.
Dodge Brothers	National	Titan Trucks
Dort	Nelson	Tower Trucks
Duesenberg Motors	Nelson Tractors	Universal Trucks
Eagle Tractors	Nelson & Le Moon	United States
Essex	Trucks	Motor Trucks
Federal Trucks	Netco Trucks	United Trucks
F-W-D Trucks	Northway	Vim Trucks
Gabriel Trucks	Oakland	Ward La France
Genco Light	Old Reliable Trucks	Trucks
G. B. S. Motors	Oldsmobile	Westcott
G.M.C. Trucks	Owens Light & Power	White
Gramm-Bern-	Plants	Whitney Tractors
stein Trucks	Packard	Wilcox Trux
Gray Dort	Paige	Wisconsin Motors
Hackett	Pan-American	Wolverine Tractors
Hall Trucks	Parker Trucks	

U. S. Pat. No. 1,135,727, April 13, 1915, U. S. Pat. No. 1,216,139, Feb. 13, 1917.
Other Patents Pending

The Scissors Test

Take sample piece of tube $\frac{1}{4}$ in. by 3 in. Stretch to 9 in. or three times its original length. Cut on edge with scissors. This cut should not be more than $\frac{1}{8}$ in. across the sample. If the strip tears apart the rubber is inferior.



Stretched, as in the tire, good tubes do not rip when cut. They cut but do not rip. Make your dealer prove that the tube he sells will stand the Norwalk test.

The slightest cut in an inferior tube — rip! and the tube is ruined.

Four Points of Norwalk Quality

1. The scissors test shows that Norwalk Tubes do not rip. It shows you that the inferior tube tears like so much blotting paper. With Norwalk the inevitable hole from puncture or blow-out can always be repaired. 2. The Norwalk Tube is the highest quality tube made — floating stock both red and gray. 3. These are two reasons why the Norwalk Tube develops mileage for you. 4. There is a Norwalk Casing ready for you as soon as the Norwalk Tube convinces you that Norwalk quality is different and better.

NORWALK TIRE & RUBBER COMPANY

Makers of Casings, Cord and Fabric; and of Tubes, Red and Gray

NORWALK, CONNECTICUT

Export Office: 100 Broad Street, New York

DEALERS If the tubes you are now selling do not meet the Norwalk scissors test, better stock Norwalks at once. This advertisement is one of a series in which we are telling the public how to test tubes before they buy.

NORWALK

TUBES and CASINGS



MASS.

The Bay State Says—

We believe Dixon's Graphite Automobile Lubricants are without an equal.

Dixon's is the easiest and most satisfactory line of lubricants to sell. In our experience covering several years, we have not had a single dissatisfied customer, which is "going some."

Yours very truly,

AMERICAN MOTOR
EQUIPMENT CO.

Boston, Mass.

*And that's the general consensus
of opinion the whole state through*

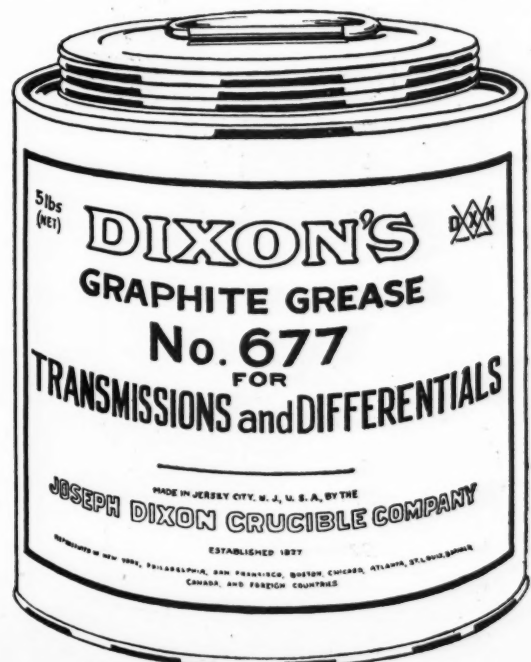
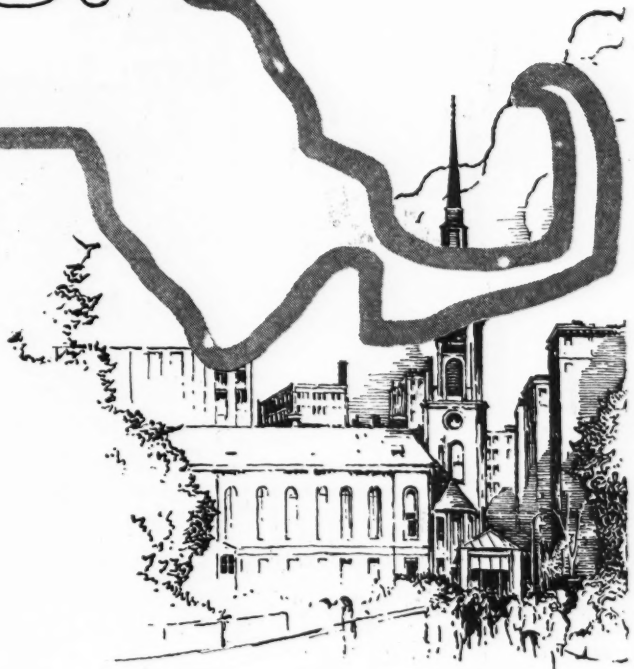
Write for booklet 82-G

DIXON'S
GRAPHITE
Transmission and Differential
LUBRICANT

JOSEPH DIXON CRUCIBLE CO.



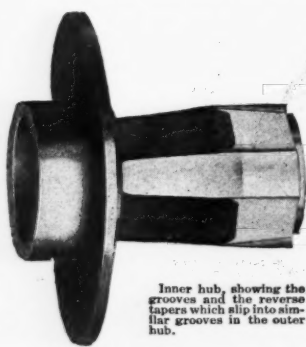
JERSEY CITY, NEW JERSEY
Established 1827



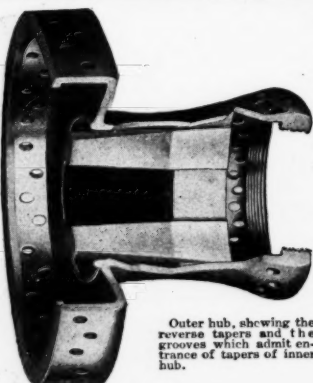
When Writing to Advertisers, Please Mention Motor Age

For Your Ford

The Wheel that Won't Come Off



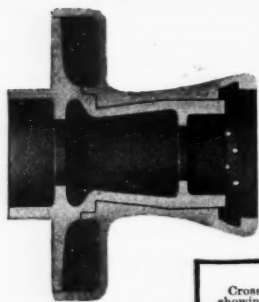
Inner hub, showing the grooves and the reverse tapers which slip into similar grooves in the outer hub.



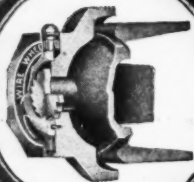
Outer hub, showing the reverse tapers and the grooves which admit entrance of tapers of inner hub.

Outside end of hub, immediately after entrance of inner hub, the reverse tapers of each part reposing in grooves opposite them.

A one-eighth turn brings reverse tapers into proper contact and matches up grooves to form seats for hub-cap wedges.



Cross section of hub, showing how reverse tapers lock together making it absolutely impossible for wheel to come off.



Hub-cap in cross section to show the tapered wedges and the ratchet lock which prevents hub-cap from working off.

Stewart

Wire Wheels

Built for Safety First

THE patented "reverse taper" construction inside the Stewart Hub guarantees positive, absolute safety. In putting the Stewart Wheel on your Ford, the reverse tapers of the outer hub slip easily into the grooves of the inner hub. One-eighth turn engages the tapers. When the steel wedges of the hub cap are seated in the slots formed between the engaged tapers and the cap is screwed tight, the Stewart Wheel positively cannot come off by accident.

This absolute safety distinguishes Stewart Wire Wheels from all others. In other wheels, the side-thrust must practically all be borne by a frail hub cap. In the Stewart, this strain is borne by the solid taper construction inside the hub. The hub cap simply holds the wedges in place. An ingenious self-acting ratchet lock keeps the hub cap from vibrating loose.

Quick Changes, Beauty, Comfort and Economy

Tire changes quickly made. Simply remove hub cap. Give wheel one eighth turn and slip off. Slip on other wheel. Give one-eighth turn and apply hub cap. Easiest wheels on earth to change. Stewart Wheels add attractiveness to your Ford. Their sturdy resiliency absorbs all road shocks and increases comfort in riding. They save tires and gasoline, giving you real economy in increased mileage and actual expense saved.

Order a set of Stewart Wheels for your Ford through your Ford dealer. If he is not prepared to serve you, write us and we will see that you are supplied.

Stewart

Wire Wheels

Set of 5 Stewart Wheels, with 4 inner hubs, 4 hub-caps, hub-cap wrench, dust cover for spare wheel, etc. Choice of colors—black, white, cream, green, blue, red or khaki.

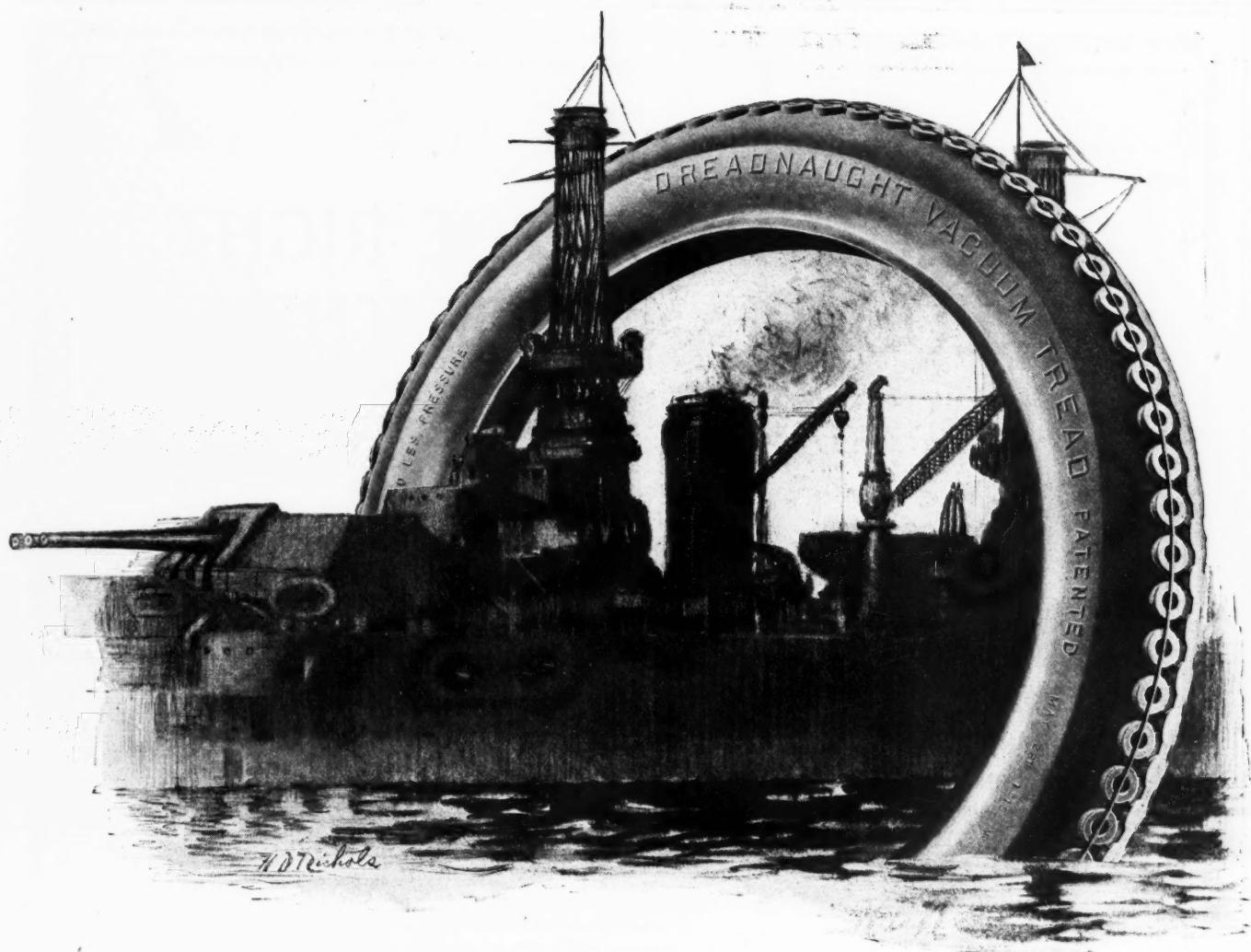
\$70

TO FORD DEALERS

Stewart Wire Wheels are superior in safety, comfort, beauty, convenience and economy. They are backed by a strong, aggressive advertising and selling campaign. They present an opportunity for any good energetic Ford dealer to build up a splendid business among Ford owners. Every set sold will bring additional sales to friends of the buyer.

Stewart Wire Wheel Corporation
401 to 437 W. Barnard St., Frankfort, Ind., U.S.A.

The Stewart Hub Makes Safety Sure



DREADNAUGHT TIRES

STAMINA—That is the word—stamina, the inbuilt capacity to endure. It is this enviable quality which empowers DREADNAUGHT TIRES to yield mileage in excess of the popular guarantee.

6000 MILES GUARANTEED

Manufactured by
THE DREADNAUGHT TIRE & RUBBER CO.
BALTIMORE, MARYLAND

DEALERS who consider that they are entitled to share in the benefits of selling DREADNAUGHT TIRES are invited to wire or write for terms.

CHARLES F. U. KELLY, Inc., Sales Department, 1834 B'way, New York

SELECTION OF THE RIGHT LUBRICANT FOR THE NC-4 FLEET

IT is not our desire to snatch one mite of the homage and credit due the intrepid and fearless crew who took their lives in their hands and sailed out into the unknown—but efficient, perfect and constant lubrication was the greatest factor in the ultimate success of this adventurous trip. Hence, the Navy left nothing to chance. Grilling, practical tests, scientific investigation, exhaustive research, were all combined against the possibility of disastrous engine troubles resulting from poor lubrication.

The choice of GULF LIBERTY AERO OIL, therefore, was made with a positive knowledge that it would fulfill every requirement, and the success of the NC-4 has proven the wisdom of the choice.

Supplied by

Gulf Refining Company

Manufacturers of

**SUPREME AUTO OIL AND THAT
GOOD GULF GASOLINE**

ANDERSON

A Motor Car Innovation

That Will Be Told to Millions

"GIVE me a car," you have said, "that stands apart from the common run, that has proven its excellence on the open road; a car good to look upon, yet beneath its good looks has a staunchness and ruggedness that will enable it to perform as well three years hence as it did the day it left my showroom."

Consider the Anderson from these aspects.

It has been tested by thousands of users who have set upon it their stamp of enthusiastic approval. Heretofore the South has absorbed the major part of our output, but increased production enables us to enter other territory.

It is built by a company of rock-bound financial stability and thirty years' manufacturing reputation.

Its specifications read like a list of foremost parts manufacturers in America.

The bodies are custom-built in the Anderson factory, the finish hand applied and hand rubbed, affording a deep and lasting luster.

There are added touches and refinements ordinarily found in only the highest priced cars.

Finally, in the Anderson Convertible Model is a body innovation that will appeal to thousands of prospective car owners—a two-passenger roadster, easily and quickly converted into a five-passenger touring car.

The Anderson story will be told to millions in mediums of national circulation.

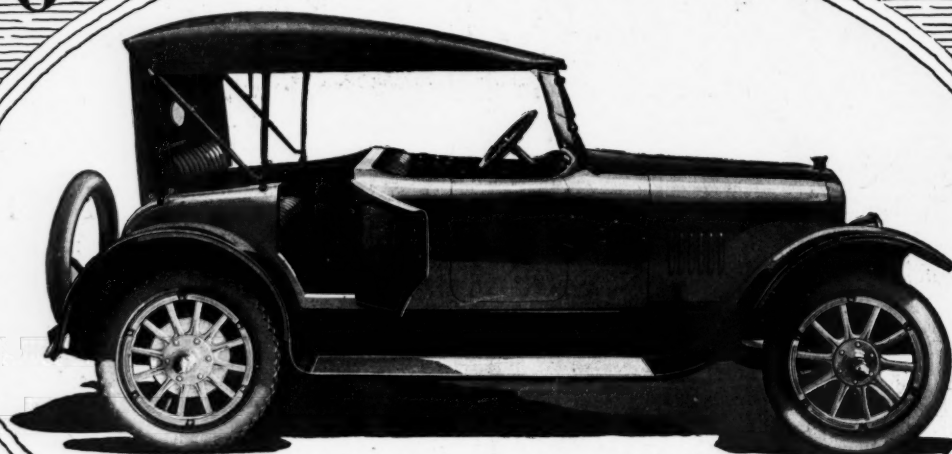
The opening gun is a page in *The Saturday Evening Post* of July 19. There is some choice Anderson territory to be had by responsible car merchants.



Instantly convertible from
a dashing roadster to a five-passenger
touring car.

ANDERSON MOTOR COMPANY
ROCK HILL, SOUTH CAROLINA

ANDERSON
6



Convertible Roadster, showing rear deck open—a real touring car. Price, \$1675 F. O. B. Rock Hill.

ANDERSON

TWO CARS IN ONE

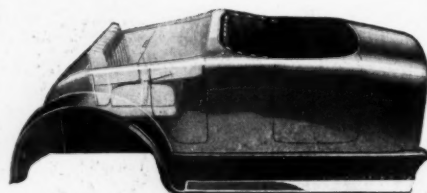
A LONG, slender, rakish roadster—the kind that causes necks to crane around and lips to utter: “There’s a car I’d like to own.”

Cleverly and completely concealed by the graceful slope of the rear deck is a surprisingly large tonneau, transforming the car in a moment from a roadster to a touring car, yet leaving no indication of its convertible qualities.

That is the Anderson convertible model—patented in the United States and ten foreign countries.

It is the last word in body construction—the wanted feature—the answer to the desire on the part of the vast majority of motorists for both a roadster and a touring car.

Here is value indeed at \$1675.

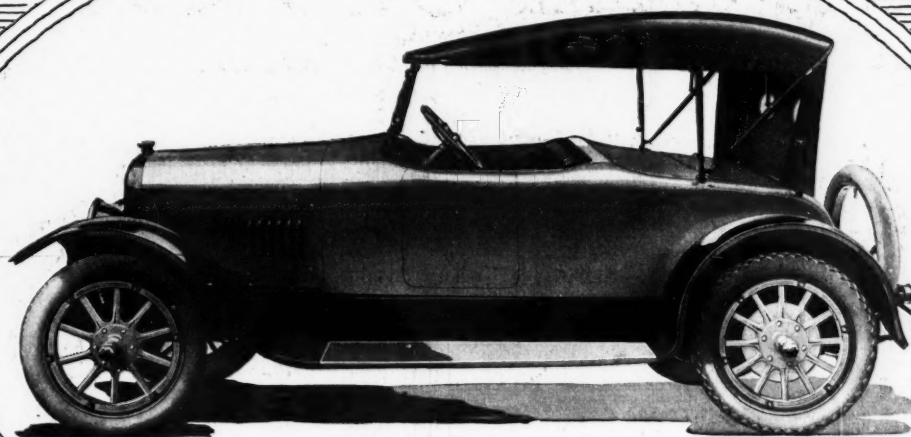


Showing detail of patented convertible feature.



Three persons can be comfortably accommodated in rear compartment.

ANDERSON
6



Convertible Roadster, showing rear deck closed. A dashing two-passenger car. Standard color, Hungarian Blue.

MOTOR CARS

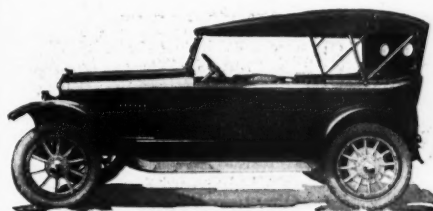
An Automotive Triumph

POWER on the hills, speed on the stretches, perfect control in the densest traffic, immediate response to accelerator or brake, easy on tires and miserly on gas—that is the Anderson.

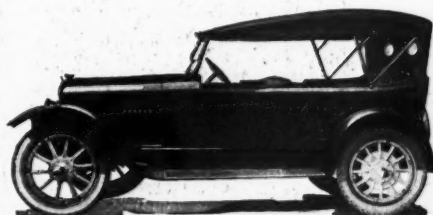
It is a product of the finest engineering minds of America. Each mechanical unit is accepted throughout motordom as the finest of its kind. Workmanship of highest standards has welded these units into a perfect whole. As a result you have a car not only alluring to the eye but superb in its performance.

Every Anderson body is custom-built in the Anderson factory. The framework is of seasoned hardwood, the finish hand applied, involving twenty-one operations. The upholstery is of genuine leather, molded over curled hair and soft cushion springs.

No detail has been slighted to make the Anderson the embodiment of beauty, comfort and performance.



The five-passenger touring car. Standard color, Anderson Blue. Price, \$1675 F. O. B. Rock Hill.



The seven-passenger touring car. Standard color, Anderson Maroon. \$1750 F. O. B. Rock Hill.

ANDERSON

General Specifications

Bodies—Custom-built by Anderson, frames made of dry seasoned oak and ash, sawed to shape, braced and counterbraced.

Finish—Hand applied and hand rubbed, involving 21 distinct operations. Finish is of unusual lustre and very lasting.

Upholstery—Seats and cushions slightly tilted and form-fitting, built of real curled hair over fine-coiled springs.

Motor—Continental High Speed, Six Cylinders, $3\frac{1}{4}$ " x $4\frac{1}{2}$ " "L" type, cast en bloc, 40 H. P.

Lubrication—Constant level, forced feed and splash. Oil indication gauge on dash.

Carburetor—Improved Zenith, horizontal type, no adjustments. Warmed by hot-air pipe. Choker on dash.

Ignition—Connecticut, with automatic advance.

Lighting and Starting—Westinghouse, two units, 6 volts with Bendix drive. Headlights with dimmer and tail light, cowl light.

Clutch—Borg & Beck Dry Disc type, non-slipping and easy of operation.

Transmission—Selective type. Bell housing completely covers flywheel. Gears of nickel steel, case hardened. Annular ball bearings. Two universal joints.

Cooling—Centrifugal pump and ball-bearing fan. Capacity of radiator, $4\frac{1}{2}$ gallons.

Axles—Front, one piece I-beam, drop forged. Standard Elliott type. Extra large steering spindle knuckles. Rear axle, full floating, spiral bevel differential gears, always in mesh and noiseless. Ball bearings in front axle, Hyatt High Duty roller bearings in rear.

Springs—Semi-elliptic and underslung. Main leaves of chrome vanadium steel; front, 36 x 2, seven leaves; rear, 56 x 2, nine leaves.

Steering—Irreversible, left-hand control.

Tires—33 x 4, non-skid in rear.

Fenders—Crown type, extra heavy gauge steel.

Top—One-man, Anderson design, built of Rayntite. Quick inside attachable storm curtains.

Windshield—Two-section plate glass, rain vision type, with easy adjustments.

Wheelbase—120 inches. **Weight**—2750 lbs., ready for the road.

Klaxon electric warning signal. **Stewart** speedometer. **Westinghouse** ammeter. **Willard** storage battery. Engine-driven tire pump. License brackets, **Duff** jack and full set of tools. Five demountable rims.



Four-Passenger Sport Touring.
\$1775 F. O. D. Rock Hill.
Standard color, Anderson Green.

ANDERSON MOTOR COMPANY

ROCK HILL, SOUTH CAROLINA

The Firestone Ship by Truck Bureau

—offers its service to all recognized interests in the trucking field. In over sixty-five trucking centers The Firestone Ship by Truck Bureau has been established, as announced in the newspapers of these points.

It is the Firestone desire and purpose to make The Ship by Truck Bureau of utmost practical value to truck manufacturers, truck dealers, truck owners, operators of truck haulage companies and truck express lines.

Shippers and prospective purchasers of trucks will find this Bureau supplied with data that will be immediately applicable to their problems. In short, the Firestone Ship by Truck Bureau is a clearing house for trucking information. The facts at hand will be supplied to any business house without charge.

Shippers, Merchants, Farmers, Manufacturers

You are invited to get in touch with The Firestone Ship by Truck Bureau. Let us know what you have to ship, in what volume, with what frequency, to what destination, etc. We will give full information regarding express routes and lines covering your requirements.

Motor Express Operators

You will find that it pays you to send us as soon as possible full information regarding the service you offer—the route you cover, tonnage capacity of trucks, schedules, rates, and any other data which you can furnish that would interest shippers.

THE FIRESTONE SHIP BY TRUCK BUREAU

Branches in leading cities

Firestone Park, Akron, Ohio

Or consult your nearest Firestone Ship by Truck Bureau. Established in the following cities

Akron, Ohio
Albany, N. Y.
Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Boston, Mass.
Brooklyn, N. Y.
Buffalo, N. Y.
Charlotte, N. C.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Dallas, Tex.
Davenport, Iowa
Des Moines, Ia.
Detroit, Mich.

El Paso, Tex.
Erie, Pa.
Fargo, N. D.
Grand Rapids, Mich.
Great Falls, Mont.
Harrisburg, Pa.
Hartford, Conn.
Houston, Tex.
Indianapolis, Ind.
Jacksonville, Fla.
Kansas City, Mo.
Los Angeles, Cal.
Louisville, Ky.
Memphis, Tenn.
Minneapolis, Minn.



The Sign of Good Trucking Service:
Manufacture—Operation—Maintenance

Milwaukee, Wis.
Minot, N. D.
Nashville, Tenn.
New Orleans, La.
Newark, N. J.
New York City
Oakland, Cal.
Oklahoma City, Okla.
Omaha, Neb.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
Providence, R. I.
Richmond, Va.
Rochester, N. Y.
Salt Lake City, Utah

San Antonio, Tex.
San Francisco, Cal.
Scranton, Pa.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
St. Louis, Mo.
Syracuse, N. Y.
Toledo, Ohio
Washington, D. C.
Wichita Kan.
Youngstown, Ohio

Announcing the New

Stewart

SPARK
PLUG

\$1.25

The Latest *Stewart* Custombilt Necessity

The Last Word in Spark Plugs—An Instantaneous Hit!

THE Stewart is a composite of the best features of every spark plug on the market; all their weaknesses eliminated. Not one freak idea in its entire makeup. A veritable giant in construction. A truly heavy duty "custombilt" plug. Its massive design enables it to take tremendous abuse in service. Insures a hot, fat spark at all times.

The Stewart is destined to become one of the most popular, widely-used spark plugs, and a leader in the Stewart "Big Ten" Family. Big advertising campaign. Free literature for you. Order a stock of Stewart Plugs at once thru jobber or direct.

Stewart-Warner Speedometer Corporation, Chicago, U. S. A.

Core is large sized, non-breakable, and oil-proof to prevent short-circuiting. Electrode is silver-soldered to center stem, making a positive connection. Two copper gaskets hug core at top and bottom. Center electrode is packed with leak-proof cement.

Is absolutely compression-tight. Gives more power, greater flexibility and economy.

The HUFFMAN TRUCK

\$1495

With Internal Gear Drive
\$1695 with Worm
Drive



The Lowest Priced Truck in America For Its Hauling Capacity

When a dealer sells a Huffman Truck he sells a transportation unit that not one of his competitors can offer. He sells more than a mere truck—he sells an **unusual** truck with a hauling capacity of 2,000 to 5,500 lbs. including body weight.

The solid foundation of the Huffman merchandising plan is this—power and strength for heavy loads; speed and flexibility for light loads. That's why the Huffman is a truly all-purpose motor truck.

Good territories are open for the right kind of dealers. Complete details of our selling plan will be sent on request.

SPECIFICATIONS

MOTOR—4 cyl. Continental—Red Seal.
IGNITION—Dixie High Tension Magneto.
CARBURETOR—Zenith.
CLUTCH—Fuller—Dry Disc Type.
TRANSMISSION—Fuller—Unit Power Plant Type.
STEERING GEAR—Layne Irreversible.
FRAME—Hydraulic Pressed Steel Channel.
FRONT AXLE—Drop Forging with Timken Bearings.

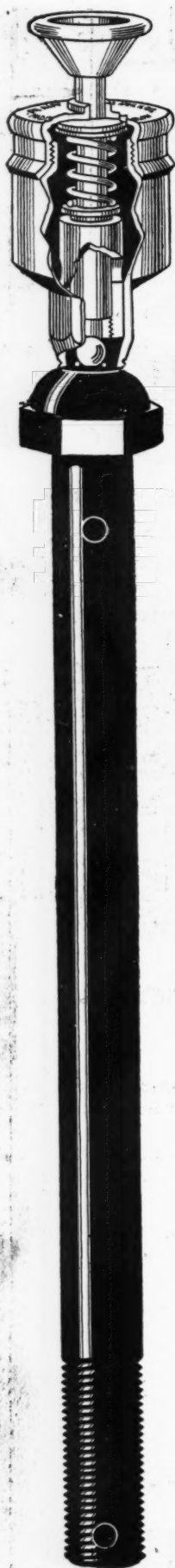
REAR AXLE—Torbensen Internal Gear or Standard Worm Drive.
SPRINGS—Perfection—Special Design.
TIRES—Firestone.
WHEELBASE—140 inches.
LOADING SPACE—10½ ft. from rear seat to end of frame.
CHASSIS WEIGHT—3200 lbs.

HUFFMAN BROTHERS MOTOR COMPANY

Main Office and Factory,

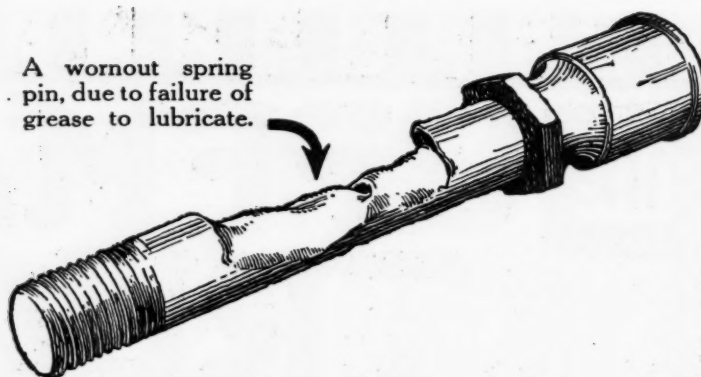
Elkhart, Indiana

Branch and Show Room, 2425 Michigan Avenue, Chicago, Ill.



For Fords, new king-pins with vertical Oil-Kipps are furnished.

A wornout spring pin, due to failure of grease to lubricate.



Oil-Kipps

They Stop the Gnawing Squeaks

Every squeak in a car means a gnawing friction eating away spring-bolts, steering knuckles and other parts.

These squeaks are caused by improper lubrication.

Grease cups and grease cannot lubricate parts that move only slightly and never rotate completely.

It takes oil to do that—heavy oil, shot to where it is needed by Oil-Kipps.

Oil-Kipps shoot heavy oil over the entire bearing surface of spring-bolts, king-pins, steering knuckles and the like.

Do Away With Grease

Oil-Kipps work very simply. Just fill them from the oil-can, pull back the spring plunger, and let it shoot back.

Each filling provides twenty or more shots—enough for a month or longer.

If your patrons have squeaks and rattles in their cars, have them replace the grease cups with Oil-Kipps. There are two kinds—the vertical and the horizontal.

They make cars run smoothly and silently; they make steering easy. And they do away with the dirt and inconvenience of grease.

What Some Dealers Do

Some of our most successful dealers fill the Oil-Kipps with kerosene as soon as they are applied to the steering gear or spring bolts.

Then they snap the spring plungers until the kerosene has been shot out.

The caked and gummy grease is washed out by the kerosene.

Then they fill the Oil-Kipps with

oil and shoot them five or six times.

When the car starts the owner is amazed at the ease with which it steers, and the disappearance of formerly baffling squeaks.

In the last six months many garages and parts dealers have started to handle Oil-Kipps, but there is room for more.

Write for our dealer plan.

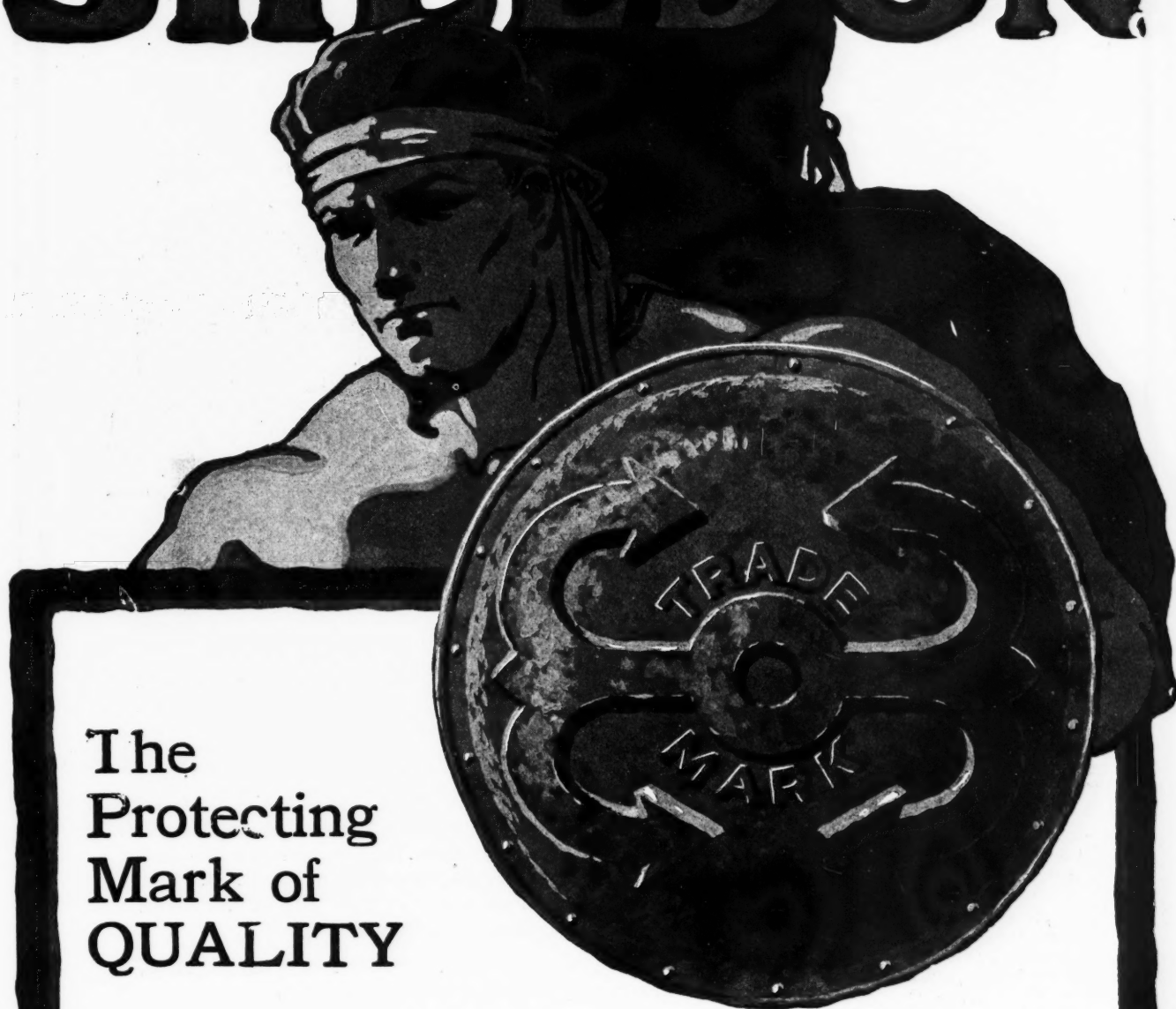
MADISON-KIPP CORPORATION

MADISON, WISCONSIN, U. S. A.

Oil-Kipps

KEEP CARS NEW

SHELDON



The Protecting Mark of QUALITY

ANY truck with the Sheldon Trade Mark on its rear axle carries its own endorsement. It must be an exceptionally good truck to afford so fine a driving assembly.

Sheldon Worm Drive Axles have always been made for trucks of the better class. They have never been produced to meet a price, but to sup-

ply the demands of manufacturers who are prepared to pay a somewhat higher price for the sake of the additional security it brings them.

The first thing to look for, in buying a truck, is the Sheldon Trade Mark. When you find that, you can safely take the rest for granted.

SHELDON AXLE & SPRING CO., Wilkes-Barre, Penn.



*Makers of Springs and Axles for Heavy
Duty Service for more than Fifty Years*





TRACTOR farming has opened an entirely new field for the spark plug dealer—a field already large—and growing at a tremendous rate.

Our engineers studied this field in its infancy and were the first to produce an exclusive, successful tractor plug.

In spite of their far greater cost to manufacturers Bethlehem tractor plugs have been adopted as standard equipment on International Harvester tractors, the Cletrac, the Holt, the Monarch, the Hart-Parr and others* whose makers put dependability above price.

With this as an index of the kind of plug we build, you can readily see the profit in handling it.

E. W. Schwalb

THE SILVEX COMPANY
South Bethlehem, Pa.

President

3/4 inch long mica tractor plug. Used as standard equipment on International Harvester Tractors and others.

Bethlehem

**SPARK
PLUGS**



SUPERIOR MERIT POINT No. 5

Dealers — When selling the Peteler Jack, Point Out This Lifting Bar Feature

COE-STAPLEY

Peteler AUTO JACK

DESIGN FEATURES

A telescope handle that makes it unnecessary to crawl under the car.

A short stroke. No overhang of the car can interfere with the action.

The quickest stroke known in jack design ($\frac{3}{8}$ inch to each stroke).

A jack weighing $8\frac{1}{2}$ pounds with a lifting capacity of 3,000 pounds— $\frac{1}{2}$ ton over capacity.

Here is a small design item but a highly important one. Note that the head of the bar is slightly concave. This seats the axle securely. It cannot slip off, and if not correctly seated, it will adjust itself.

The Peteler Jack is the best seller in its field—simply because it is the best jack.

You show a car owner that he can raise and lower the car—and then remove the jack without releasing the handle. *He will buy on that feature alone.*

Now add to your demonstration talk, the items of design and construction noted on the left.

**This Peteler Jack
Sells for \$6.50**

There isn't a dealer reading this, who will fail to see the tremendous sales possibility among car owners in his territory.

MANY UNFORCED SALES—GENEROUS PROFITS. WRITE FOR THE BIG STORY

COE-STAPLEY MANUFACTURING CORPORATION

Factories, Bridgeport, Conn.

Sales Offices

136 Liberty Street, New York

DEALERS

If *your* Jobber, Perchance, cannot give you the Details we will Furnish Them.

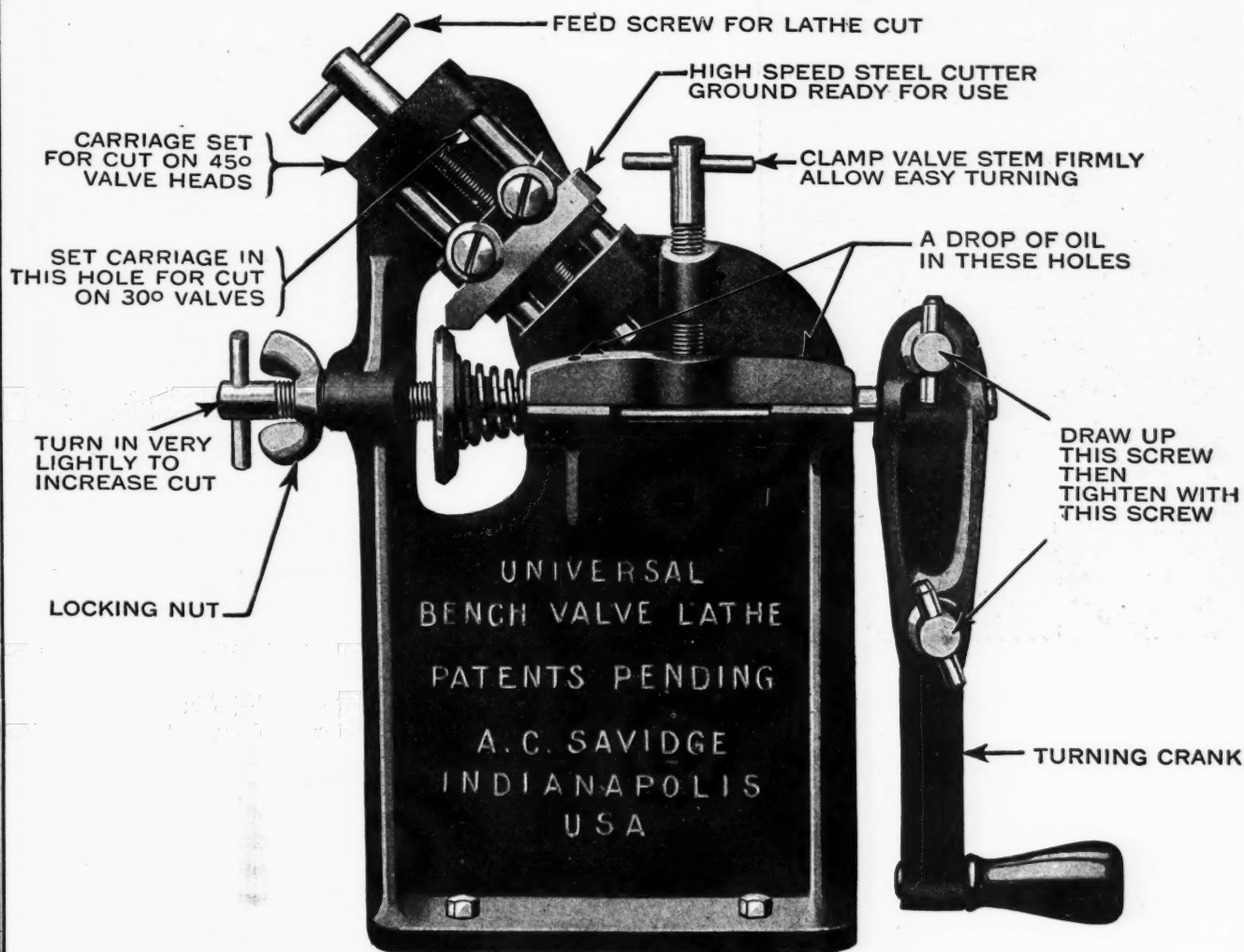


No matter where you are located there is a Harvey Jobber near you who can supply you on a moment's notice with a genuine Harvey Spring for any make or model of Automobile.

Write today for the free Harvey Spring Book, giving specifications for more than 900 kinds of Harvey Springs and other valuable information. Ask us the name of the nearest Harvey jobber.

Harvey Spring and Forging Company

1007 17th Street, Racine, Wisconsin



Trues, in a Jiffy, the Hardest Tungsten or Cast Iron Valves

No longer is it necessary for car and truck owners to neglect truing their valve heads. Here is a wonderful, simple and cheap machine that does in a few minutes the work that takes hours by other methods—and does it better, whether the valves are cast iron or steel. It soon pays for itself by increasing compression and eliminating faulty ignition. There is no need for an expert machinist to operate it—any individual can do the highest class job easily and quickly. The time it saves in seating, or the saving of one set of valves—on one job—will pay for the cost of this strong and durable lathe.

Private car owners, truck owners, small and large garages, shops with and without machine lathes, in every part of the country recognize the necessity of the Savidge Valve Lathe and are using them. They were used in the Heavy Mobile Ordnance Repair Shops of the U. S. Army.

Guaranteed—If any defect occurs in any Savidge Universal Bench Valve Lathe within one year from date of purchase, we will either repair or replace without charge, except for transportation.

Dealers—Order through your favorite jobber. If he can't supply you, write us direct.

Jobbers—There is a tremendous market for this lathe. Write us for full details.

MANUFACTURED BY

A. C. Savidge Company

No. 1 Williams Building

INDIANAPOLIS, IND



PATENTED DEC. 10, 1918

**Full directions
for use of these
tools with each
set.**



Bushing Remover

A Boon to Repair Shops

A very simple tool that enables you to remove wornout bushings in jig time. Worth its weight in gold. Saves time, effort and labor. Increases your profit by simplifying the work.

The Sioux Bushing Remover

is the result of long and tedious experimenting. Its use makes bushing removing child's play compared to the old, difficult and tedious methods.

The standard set consists of: No. 1, for removing bushings from $\frac{3}{8}$ " to 7-16"; No. 2, for bushings from $\frac{1}{2}$ " to 9-16"; No. 3, for bushings $\frac{5}{8}$ " to 11-16"; No. 4, for bushings from 23-32" to 13-16"; No. 5, for bushings from $\frac{7}{8}$ " to 1 1-16", and one No. 20 blind or pocket bushing remover. The Ford set consists of Nos. 2, 3, 4 and 5.

**Order a set today. They will
earn their cost on a few jobs.**

Sold By All Live Jobbers

**The tool that
put the "move"
in removing.**



When Writing to Advertisers Please Mention Motor Age

Why Truck Manufacturers Choose Covert Transmissions

Manufacturers who build trucks to give genuine transportation service—trucks that create good will and large sales by sheer truck performance—demand the following qualities in a transmission and in the manufacturer:

Strength
Practical and Correct
Design
Perfectly made gears and shafts

Ease of control
Sound reputation of manufacturer
Tremendous manufacturing facilities

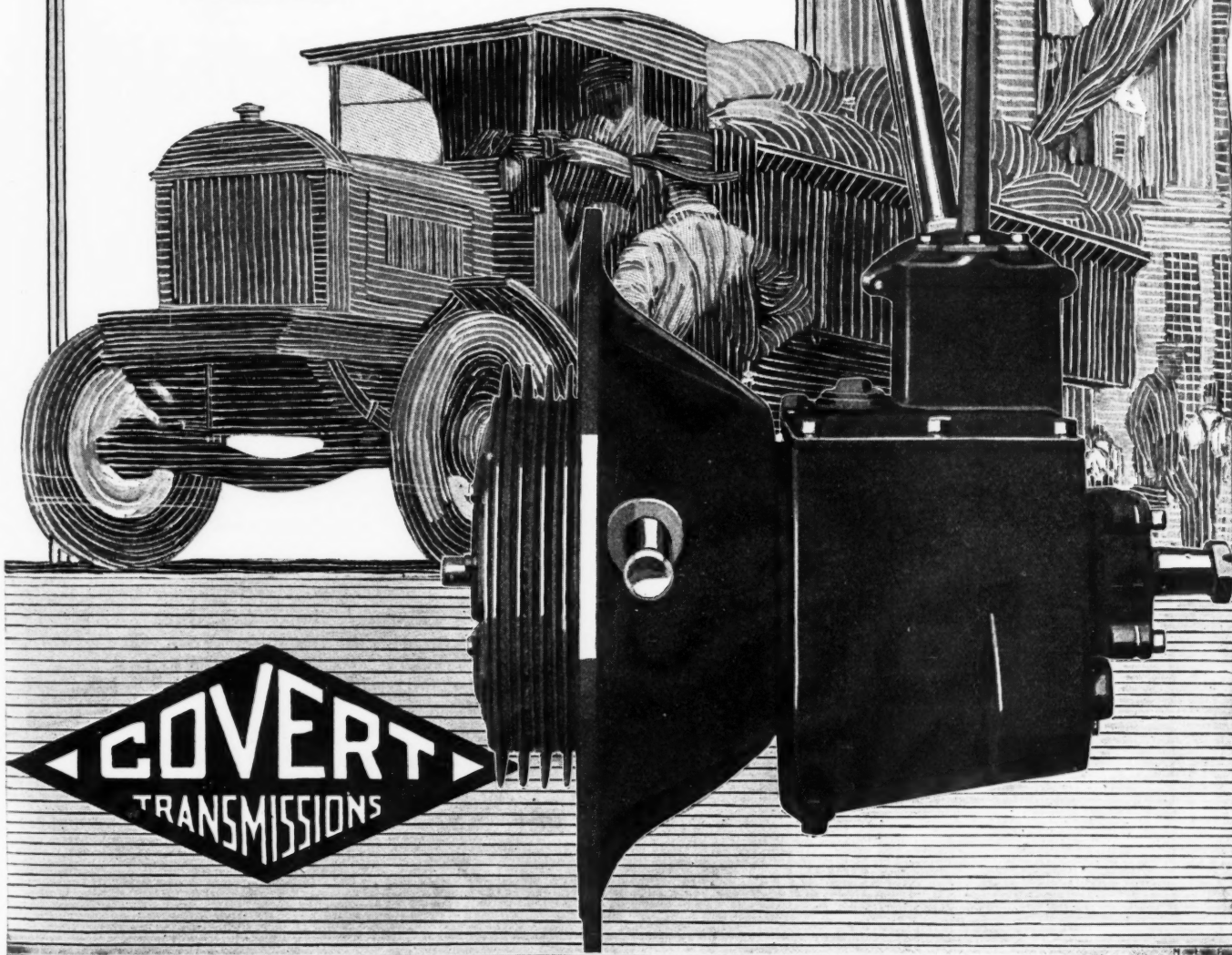
The Covert Transmission and the Covert Gear Company have always measured up to these requirements. It is an organization devoted exclusively to the manufacture of high grade transmissions for trucks, tractors and motor cars.

Covert Gear Company, Inc.

Manufacturers of transmissions, clutches and controls for passenger cars, trucks and tractors

Sales, Engineering and Service
967 Woodward Ave.,
Detroit, Michigan

Factory: Lockport, N. Y.
Export Office: 100 Broad St.
New York City, N. Y.



When Writing to Advertisers, Please Mention Motor Age



“Nip trouble in the bud”

Keep your motor fit

DON'T overlook the little engine troubles. They soon develop into big ones. Know what your engine is doing, and it is easy to keep it fit.

There is one sure way of telling at once whether you are getting the most out of your engine. That is with a G-Piel Cut-Out.

A G-Piel Muffler Cut-Out enables you to tell in a second when you are

wasting power, gas and money. It makes for economy.

When you step on the G-Piel Muffler Cut-Out you literally *blow* the carbon right out of your engine. The exhaust is cleaned and carbon accumulations are forced out of the manifold. It eliminates back pressure.

Sales Department

EDWARD A. CASSIDY CO., Inc.
Madison Ave. at 40th St., New York City
Manufacturers: **THE G. PIEL CO Inc.**

The G-Piel Muffler Cut-Out

PIEL PRODUCT

“Tells the motor's secrets”

GOODELL PRATT

1500 GOOD TOOLS

Bench Vises

When you put a piece of work in a vise for filing, sawing, drilling or anything else, you want it to stay where you put it. That is what Goodell-Pratt Vises are made for. The work once clamped in stays until released because the superior design of these vises give them a gripping power, strength, and rigidity that is really remarkable.

All Goodell-Pratt Vises are operated by a cut steel feed screw. Two steel guide rods eliminate looseness and play at the Jaws. All parts are carefully fitted which insures easy operation of the Jaws, but without lost motion.

There are five sizes to select from with Jaws 1 inch to 3½ inches wide to open 1½ to 4⅞ inches.

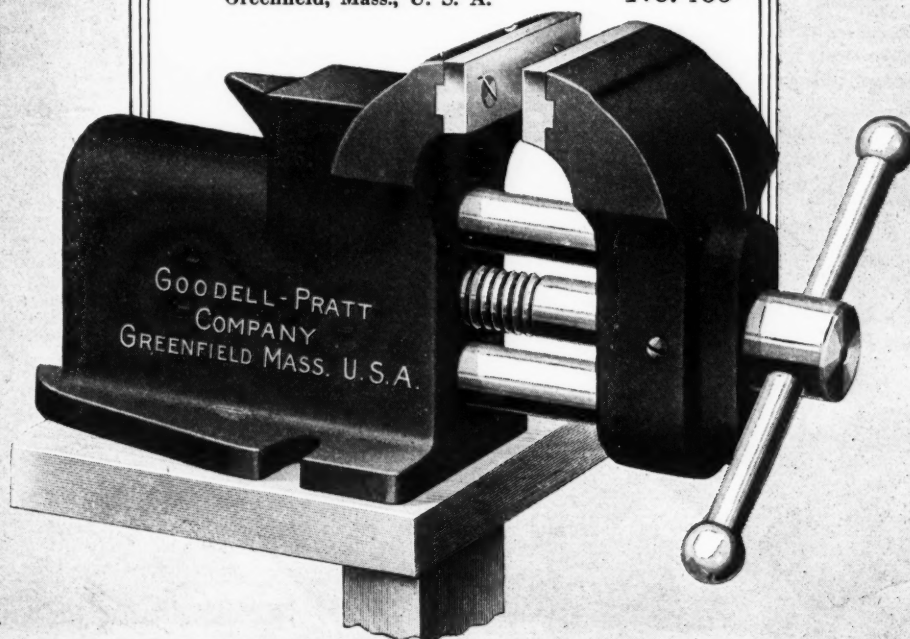
Write for Tool Book No. 13

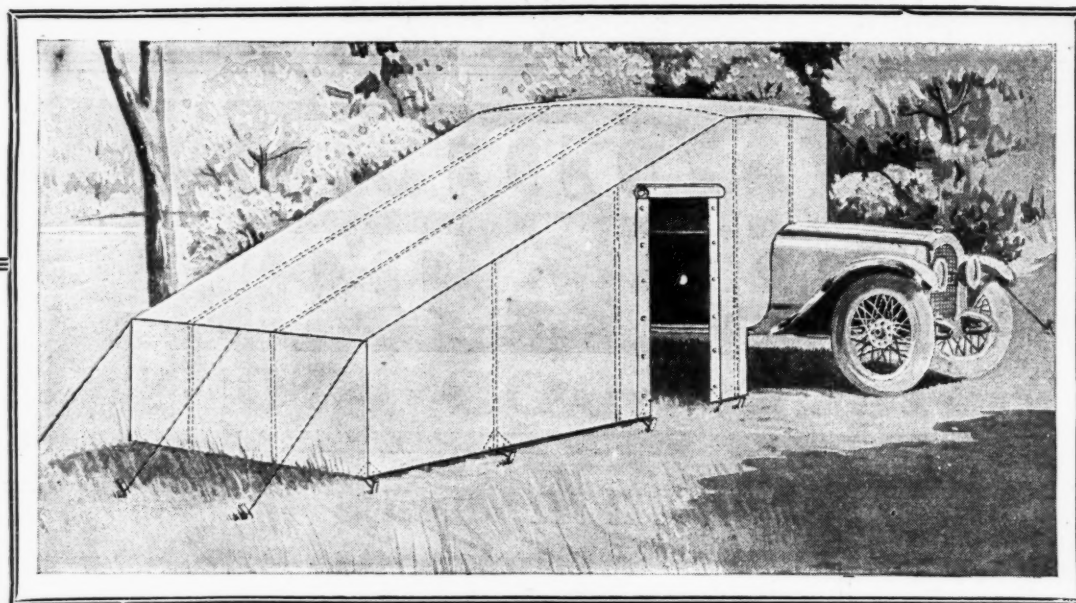
GOODELL-PRATT COMPANY

Toolsmiths

Greenfield, Mass., U. S. A.

No. 168





Baker Auto Tent and Tourist Supplies



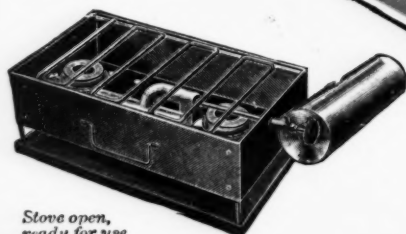
*Tourist and Campers
Water-proof Pillow*



Auto Tow Ropes



*American
Folding Camp Stoves
(Folded)*



*Stove open,
ready for use*

This tent is designed to enclose the body of the car as well as making a comfortable room for camping out. Saves unloading at night and reloading in the morning. We also make another style which does not cover Body of Car.

The items illustrated on this page are big business getters for dealers everywhere. Your supply house can take care of your orders. If not, write us direct to nearest office, giving name of your wholesaler.

We also manufacture complete lines of Awnings, Tents, Paulins, Tractor Covers, Flags and other Fabric Products.



Drivers Comfy Cushion

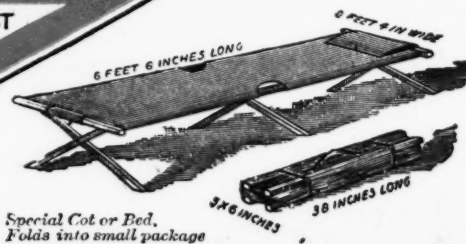
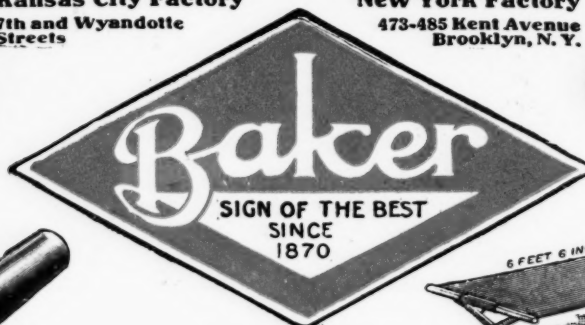


Dust Tite Du-Gie Bags

BAKER AND LOCKWOOD MANUFACTURING CO.

Kansas City Factory
7th and Wyandotte
Streets

New York Factory
473-485 Kent Avenue
Brooklyn, N. Y.



*Special Cot or Bed,
Folds into small package*

When Writing to Advertisers Please Mention Motor Age

FEDERAL

DOUBLE CABLE BASE CORD TIRES

A Big Selling Advantage

THE firm grip the Double-Cable-Base gives Federal tires to their rims, also gives Federal dealers a "firm grip" upon the tire sales of their territory.

Additional wear and long life are afforded by four twisted steel cables running through the base of the tires. They hold the tire securely on the rim, prevent tube pinching, rim cutting and blow-outs above rim, and relieve side wall chafing.

Unusual resiliency and durability are also added by our method of internal air pressure moulding of separate diagonal layers of loose cords, impregnated with live rubber. This gives even tension that distributes road strain uniformly.

Besides the black non-skid Federal Cord Tire there are the white non-skid "Rugged" tread extra ply fabric and the black "Traffic" tread.

Write for dealer information.

**The Federal Rubber Co.,
of Illinois**

Factories, Cudahy, Wisconsin

Manufacturers of Federal Cord and Fabric Automobile Tires, Motor Cycle Tires, Bicycle Tires, Inner Tubes, Accessories and Mechanical Rubber Goods



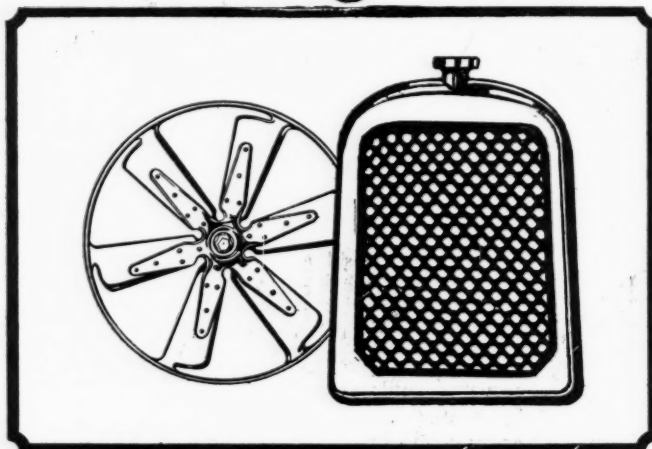
When Writing to Advertisers, Please Mention Motor Age

SPARTON

Cooling Unit



The Sparton Vacuum system is the result of seventeen years actual practice in perfecting a vacuum unit that is fool proof. Its presence on a car is an unfailing contribution to the driver's peace of mind.



The effectiveness of Sparton horns is without limit. If necessary its sturdy call carries its message a mile ahead and in emergencies its quick, vibrant note compels instant saving attention. Engineers of the finest cars built in America accord it first choice. Dealers everywhere recommend it.

Sparton "Air Shredding" Radiators Afford Greater Cooling Efficiency

MOTOR car cooling problems find solution in the new Sparton honeycomb type radiator.

By shredding the air—breaking it up into small sections—Sparton radiators bring a maximum air surface into contact with the heated water columns and insure the largest cooling surface possible in the area of the radiator.

Sparton Radiators are built of non-rusting metal with secure jointures. They do not leak.

Forty leading motor car makers now use Sparton Patented Type Radiator Fans as standard equipment. The rim-integral-with-blade design prevents bending the blades and losing the

alignment which exhaustive engineering research has proved will move the greatest volume of air with the lowest power consumption.

Sparton Radiators and Sparton Fans form a perfect cooling system for motor cars.

They are built to the same standard as other Sparton products and are equal in quality to Sparton motorhorns, now standard equipment on more than 40 leading makes of automobiles, and Sparton Gasoline Vacuum System, recognized as a leader in its field.

We invite motor car manufacturers to submit their cooling problems to our engineering department.

The Sparks-Withington Co.



Jackson, Michigan, U. S. A.

(130)

Sparton Products are First Choice of America's Best Cars

CHARACTER CARS ARE WANTED, NATURALLY, BY THE CHARACTER DEALER

HAYNES COMPANY IN BIG EXPANSION

Capital Stock Increased and
Annual Output to Be
15,000 Cars.

The capacity output of the Haynes Automobile Company, Kokomo, Indiana, will be increased to 15,000 cars annually, according to plans which were decided upon at a recent meeting of the directors of the company. To make this huge expansion possible the directors voted to construct a large new factory building and a forge shop, and to increase the capital stock from three and a half million to five million dollars.

A. G. Seiberling, under whose successful management the Haynes Automobile Company has attained its present enviable position among the leaders of the automobile industry, was elected second vice-president. In addition to his new duties Mr. Seiberling will continue as general manager. March Haynes, son of Elwood Haynes, the inventor of America's first successful automobile, and president of the company, was chosen assistant treasurer and secretary.

The vast plans for expansion by the builders of "America's First Car" were decided upon because of the unprecedented demand for Haynes cars throughout the world, and constitute one of the important responses of American industry to the Government's request that "big business" lead the way in national reconstruction.

"We decided upon this gigantic increase because there was nothing else for us to do if we are to meet the worldwide demand for Haynes cars," declares Mr. Seiberling. "The step was taken after a careful study and analysis of the automobile situation, which determined to our complete satisfaction that the demand for automobiles for several years to come will far exceed the combined output of American factories."

The new factory building, which, when completed, will be the largest of its kind in the State of Indiana, will be 500 feet long, 150 feet wide and four stories in height, making an additional factory space of 300,000 square feet. The building is to be of modern fireproof steel and concrete construction, and will be used for assembling, trimming, painting and storage. The new forge shop will have a floor space of 12,600 square feet. A 750 horse-power plant will heat the new building.

The efficient progressive system of manufacturing will be adopted throughout. Several hundred thousand dollars will be spent on up-to-date machinery and equipment, thus insuring quality and quantity production. It is estimated that the normal output of the enlarged Haynes factory will be fifty cars a day. Work on the new buildings will be started immediately, and it is expected that they will be completed early this fall.

The above illustration shows a reproduction of a news story carried by the New York Sun in their May 4th issue.



WITH the public educated to discriminate in automobiles, the far-seeing dealer naturally desires to effect a connection which insures permanence.

His own reputation is just as vital to him as a season's profits. He cannot afford to jeopardize his reputation—which is his strongest capital—by associating himself with cars which will not survive.

This is the type of dealer we are glad to talk with, if he is located in territory now available for the distribution of the new 1920 Haynes.

Haynes advertising emphasizes the four factors of character in the new 1920 Haynes—its beauty, strength, power and comfort.

Sheer beauty of lines and fittings, dependable strength of chassis and construction, velvety power of the splendid Haynes motor, and the calm comfort resulting from roominess, luxurious upholstery and smooth response of the motive power—these naturally have their instant appeal to the prospective purchaser.

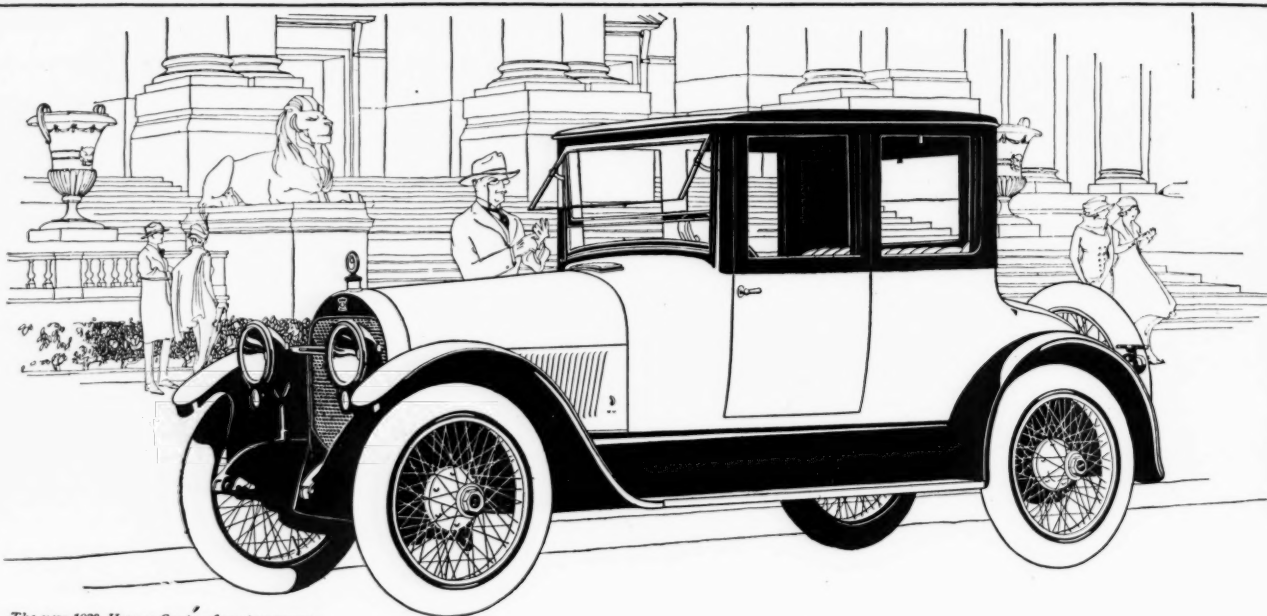
Selling the new 1920 Haynes is adding to the solid reputations of its dealers. In some sections we are willing, as we have stated, to discuss the establishing of new dealers provided they are equipped by ability and reputation to handle the Haynes.

In writing, or telegraphing, address Department 751. Personal interviews may be arranged in that way, or by telephoning us.

The Haynes Automobile Company, Kokomo, Ind., U.S.A.

1893—THE HAYNES IS AMERICA'S FIRST CAR—1919

(On the other side of this page is reproduced a Haynes advertisement characteristic of the new national campaign)



The new 1920 Haynes Coupe—four passengers—twelve cylinders—cord tires—five wire wheels—standard equipment—Price \$3800.

This Advertisement copyrighted, 1919, by The Haynes Automobile Company

FOUR FACTORS OF CHARACTER IN THE NEW 1920 HAYNES



For those who have high motor car ideals—the doctor, lawyer, architect, and business man, or the social woman of taste and appreciation—this coupe is the choice car. The commodious interiors have abundant atmosphere and are refined artistically.

HAYNES

NEW 1920 "LIGHT SIX"

Open Cars	
Touring Car—7 Passenger	\$2485
Roadster—Four Doors, 4 Passenger	2485
Closed Cars	
Coupe—4 Passenger	\$3100
Sedan—7 Passenger	3350
Limousine—7 Passenger	4000

Wooden Wheels Standard Equipment

NEW 1920 "LIGHT TWELVE"

Open Cars	
Touring Car—7 Passenger	\$3250
Roadster—Four Doors, 4 Passenger	3250
Closed Cars	
Coupe—4 Passenger	\$3800
Sedan—7 Passenger	4000

Wire Wheels Standard Equipment

Prices are F.O.B. Kokomo.

A new catalog, beautifully illustrated, will be sent on request. Addr. Dept. 751.

BEAUTY—strength—power—comfort—these are the four factors essential to character in an automobile. If one factor is lacking or if one or two are slighted to secure the others the result is an incompleteness in service and satisfaction for the owner. These four factors of character are insisted upon by the engineers and designers of the new 1920 Haynes.

The full aluminum body, with its lustrous, lasting finish, its straight, graceful lines and the thoughtful incorporation of beautifications and conveniences, lends itself harmoniously to the picture of car-beauty. The strength of the chassis and of the general construction, and the dependable, velvety power of the famous Haynes motor, accentuate the comfort of the roomy seats and hand-buffed leather upholstery, affording travel-ease without weariness of body or mental strain.

Buying a car today is not a haphazard experiment. It is an investment worthy of serious contemplation. You will buy your new Haynes for a long term of service. It will deliver this service together with honest satisfaction, because in it are skillfully blended the four factors of car-character which distinguish the new 1920 Haynes with twenty-six years of character-building history behind it.

Deliveries are being made as rapidly as is consistent with our factory inspection standards. We urge you to place your order promptly because of the unprecedented Haynes demand. If you do not know where your nearest Haynes dealer is, please write us and we will advise you.

The Haynes Automobile Company, Kokomo, Ind., U. S. A.

1893—THE HAYNES IS AMERICA'S FIRST CAR—1919

New Standards of Truck Economy

Because the Jaxon Full Floating Wheel literally "floats" the truck and the load on rubber cushions, there is a remarkable decrease in depreciation, operating and maintenance expense.

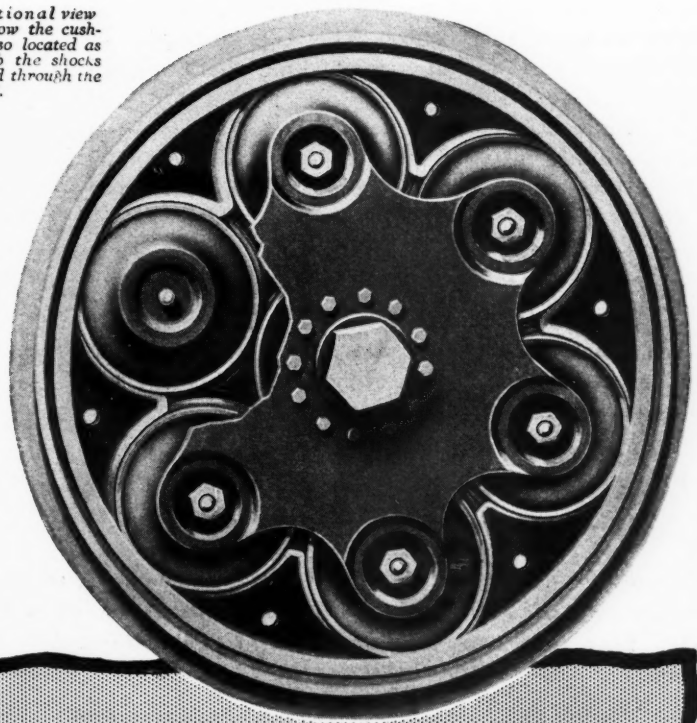
Practically every wasteful expense of operating a motor truck comes from shocks and vibrations. By absorbing the shocks—torque and side-thrust, as well as radial—this needless expense is effectively eliminated.

Jaxon Full Floating Wheels also more than double the life of solid tires and increase gasoline mileage from twenty-four to thirty-six per cent.

Jaxon Wheels are available for a large number of makes of motor trucks. Write for descriptive catalog.

Jaxon Steel Products Company
Wheel Division, 3066 West Grand Boulevard
Detroit, Michigan

Cross-sectional view showing how the cushions are so located as to absorb the shocks transmitted through the felloe band.



JAXON

Full Floating Wheels

When Writing to Advertisers, Please Mention Motor Age

Ford Springs Plus Float a Fords

Make Driving Luxury

Float-a-Ford luxury is the combined cushion of the Ford spring plus a correct shock absorber.

Putting shock absorbers on your car is often like "swapping dollars." In many cases the springs of the car are so bound by the shock absorber that they are almost unable to do their duty. Their efficiency is greatly reduced. The work of overcoming road shocks is merely transferred from the springs to the shock absorbers.

Float-a-Fords do not take something away from your car to accomplish results. They do not substitute shock absorber for spring. They are distinctly an addition to your spring cushion—they make a Ford ride like a \$3,000 machine.

Float-a-Fords not only permit free spring action but are easily installed without boring a single hole in the frame or axles. They do not ask you to tamper with your car.

Principle is Right

Words cannot describe the wonderful luxury of driving on Float-a-Fords. Any Ford owner will be well repaid for seeking a demonstration from his local dealer.

An understanding of the Float-a-Ford principle is convincing, however.

Distributors and Dealers—If Float-a-Fords are not sold in your territory, investigate our proposition and the shock absorber itself. Then decide whether you wish to handle Float-a-Fords or compete with them.

We authorize dealers to guarantee Float-a-Fords

Burpee-Johnson Company

Kentucky Ave. and Missouri St.

Indianapolis, U. S. A.



THE WAY YOU RIDE WITH FLOAT A FORD

THE ROAD

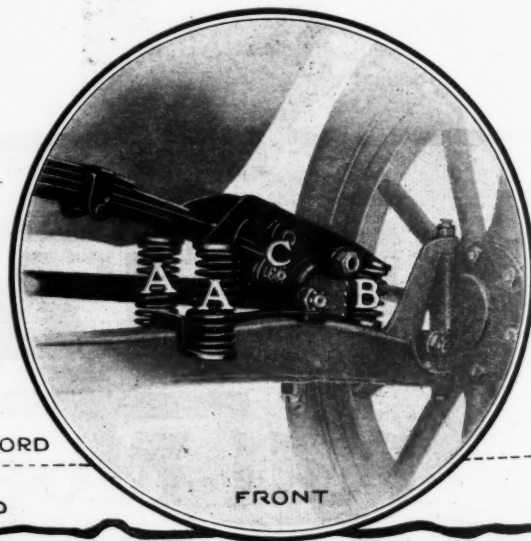
Note the illustration on this page. When a car strikes a bump the first shock is downward. This shock is absorbed not only by the main spring of the car but by the three springs of the shock absorber. The springs (AA) are compressed. Spring (B) expands. Immediately there comes the rebound. The shock is upward, but spring (B) is on guard to absorb the shock by resisting the compression. The springs (AA) again come into action. Forced to expand past normal, they gently check the rebound. Note the suspension at the point (C). This bearing not only allows free expansion and contraction of the Ford springs, but takes the stiffness out of the entire device. It insulates your car against side thrusts.

Soon Pay for Themselves

Float-a-Fords soon pay for themselves in saving on tires, gasoline and wear and tear on your car. Once you install them, you'll say they are worth many times their cost in genuine luxury and ease of driving, such as you have never known before.

Float-a-Fords in three weights: touring or coupe; sedan or commercial; and roadster.

Get in touch with the Float-a-Ford dealer and arrange for demonstration.



When Writing to Advertisers, Please Mention Motor Age

Performance vs. ?

In selecting a Compressor, what interests you most? Prices? No! Promises? No! Technical details? No! In the end, it is the cost of giving air service. You must have confidence in the concern that sells the outfit, confidence in the manufacture, and confidence in the future performance of the outfit.

Brunner Air Compressors have come to the front in the minds of the progressive garage men of the country. Brunner equipment has won and is holding national leadership as the undisputed standard.

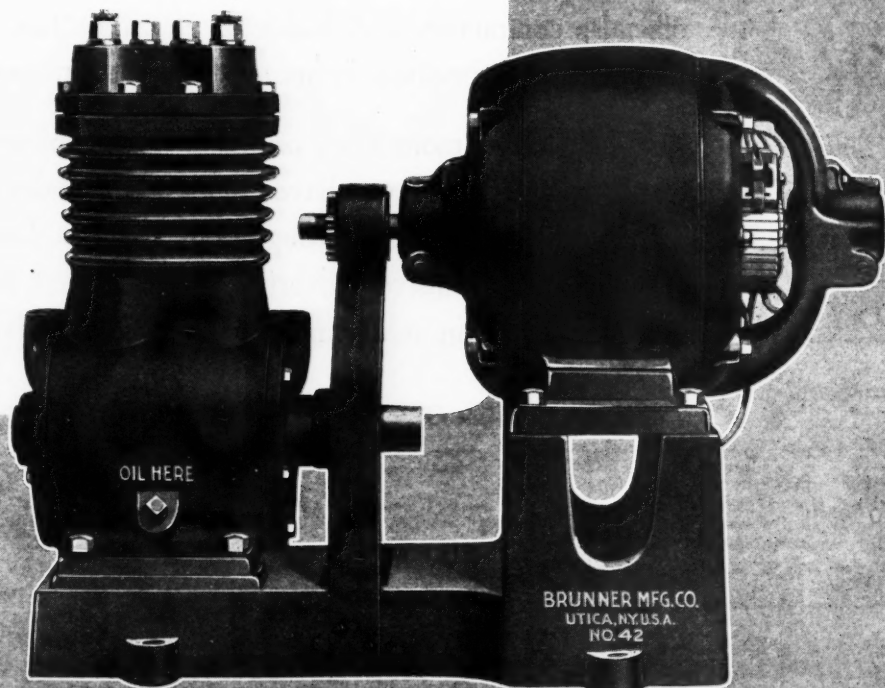
No sales argument, no frenzy of advertising, no freak fixtures could win and hold that dominance. Brunner equipment has construction care that spells Performance. And, Performance merits leadership.

Brunner engineers use the laws of pneumatics ---they know the intricacies, complex problems and possibilities---after years of study and putting these laws into practice their resultant products give consistent economical Performance.

Write for illustrated folder,
displaying all types
and sizes.

BRUNNER MFG. CO.

Works
UTICA, NEW YORK
Sales Offices
UTICA, N. Y.
CINCINNATI, O.



The Advertising of Motor Trucks

The Digest is first of the
five leading magazines with

More Trucks---More Pages

As shown on the opposite page motor truck advertisers in The Digest are more numerous than in any other general publication, and quite as important, also, is the fact that the average schedule is larger. In other words, The Digest is recognized as having the richest motor truck market.

Based on the first six months of 1919, each motor truck advertiser will average nine full pages in The Digest in the twelve months of the year.

In every year for the past five years The Literary Digest has led in motor truck advertising because it is read by busy executives, by progressive technical men, wide-awake storekeepers, to whom its news information is most necessary. It is the buying power of The Digest's hundreds of thousands of manufacturers, wholesale and retail business men, as well as officials in railroad, industrial and public utility corporations, government officials, contractors and builders, etc., that has held The Digest in its premier position in motor truck advertising.

We have more than ordinary dealer influence in the motor truck field because we have made the dealer acquainted with The Literary Digest through our Motor Truck Supplements, and through extensive advertising in the best trade publications, in newspapers, in magazines, and in street cars

The Advertising of Motor Trucks

The number of pages used
in five leading magazines

First Six Months of 1919

ADVERTISERS	Literary Digest	Saturday Evening Post	Leslie's	Collier's	Scientific American
Acme Motor Truck Co.	3 1/4 Pages	1 Pages	1 Pages	1 Pages	Pages
All-American Truck Co. . . . .	.....	.....	.....	2 "	.....
Atterbury Motor Car Co.	1 "	.....	1 "	1 "	1 "
Autocar Co.	6 "	5 "	.....	.....	.....
Bethlehem Motors Corp.	2 "	4 "	1 "	2 "	2 "
Clyde Cars Co. . . . .	.....	3 "	.....	1 "	.....
Diamond T Motor Car Co.	5 3/4 "	3 "	.....	.....	6 "
Dodge Brothers	3 "	.....	.....	1 1/2 "	.....
Duplex Truck Company	4 "	6 "	.....	.....	.....
Federal Motor Truck Co.	3 "	.....	3 "	3 "	6 "
Four-Wheel-Drive Auto Co.	5 "	7 "	.....	6 "	.....
Fulton Motor Truck Co.	4 "	1 "	3 "	.....	3 "
Garford Motor Truck Co.	6 "	5 "	.....	.....	.....
General Motors Truck Co.	6 "	.....	6 "	.....	5 "
Graham Brothers . . . . .	.....	1 "	.....	.....	.....
Gramm-Bernstein Motor Truck Co.	6 "	6 "	.....	.....	.....
International Motor Co.	6 "	2 "	.....	.....	10 "
Kelly-Springfield Motor Truck Co.	4 "	5 "	.....	.....	.....
Kissel Motor Car Co.	4 "	3 "	.....	.....	.....
Maxwell Motor Co., Inc. . . . .	.....	.....	4 "	.....	.....
Menominee Motor Truck Co. . . . .	.....	.....	1 "	.....	.....
Nash Motors Co.	6 "	1 1/2 "	.....	4 "	.....
Olds Motor Works	3 1/4 "	1 1/2 "	.....	5 "	.....
Packard Motor Car Co.	2 "	1 "	2 "	2 "	3 "
Paige-Detroit Motor Car Co.	3 1/2 "	3 1/2 "	1 1/2 "	.....	3 "
Pierce-Arrow Motor Car Co.	6 "	.....	.....	.....	6 "
Reo Motor Car Co.	1 "	1 "	4 "	5 "	.....
Republic Motor Truck Co., Inc.	6 "	20 "	3 "	4 "	3 "
Selden Truck Sales Co.	5 3/4 "	.....	1 "	2 "	4 "
Service Motor Truck Co.	6 "	.....	6 "	.....	6 "
Stewart Motor Corp.	6 "	2 "	.....	1 "	.....
Traffic Motor Truck Corp. . . . .	.....	5 3/4 "	.....	.....	.....
Trailmobile Co.	4 3/4 "	2 1/4 "	1 1/2 "	.....	.....
Troy Wagon Works Co.	5 "	5 "	.....	.....	.....
White Co.	9 "	9 "	5 "	2 "	6 "
J. C. Wilson Co. . . . .	.....	2 "	.....	.....	.....
Winther Motor Truck Co.	3 1/4 "	.....	1 1/2 "	.....	1 "
Total Number of Pages	134 Pages	104 1/2 Pages	45 1/2 Pages	41 1/2 Pages	65 Pages
Number of Advertisers	30	26	17	16	15

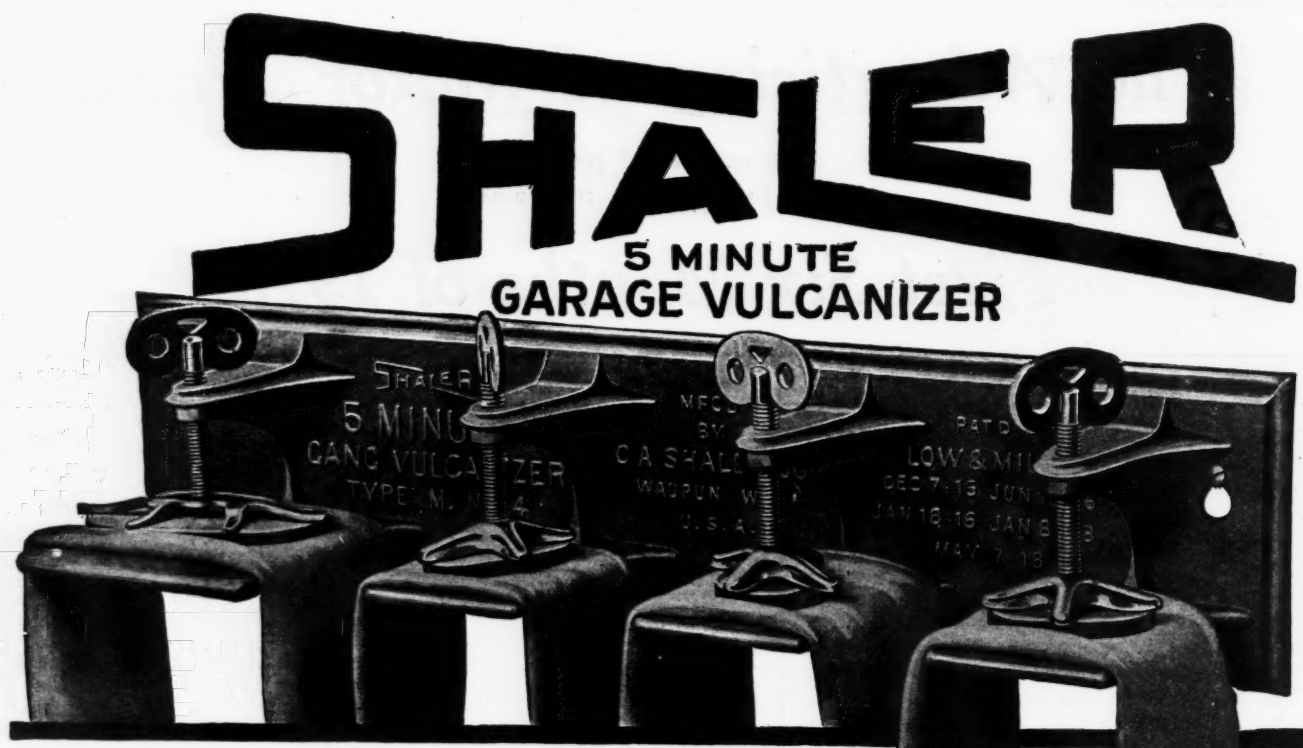
THE RECORD OF MOTOR TRUCK ADVERTISING FOR FOUR YEARS

1915	Advertisers	1916	Advertisers	1917	Advertisers	1918	Advertisers
The Literary Digest	11	The Literary Digest	21	The Literary Digest	39	The Literary Digest	32
Collier's	7	Scientific American	12	Saturday Evening Post	27	Saturday Evening Post	28
System	7	Saturday Evening Post	12	Collier's	15	Scientific American	23
Review of Reviews	6	System	11	Scientific American	14	Collier's	16
World's Work	6	Review of Reviews	8	System	10	Leslie's	11

IMMEDIATE National Publicity

The Literary Digest

IMMEDIATE National Publicity



Complete Outfit \$7

Free Patches Enough to Pay for It

To quickly introduce this wonderful new Shaler Garage Vulcanizer—we will send **Absolutely Free**, with each outfit—an assorted supply of Shaler Patch-&-Heat Units, that will make repairs enough to more than pay for the outfit.

This new gang vulcanizer was designed especially to meet the demand from Garages and Repair Shops for a large capacity, quick action, dependable vulcanizer, that uses the convenient Shaler Patch-&-Heat Units. These handy units are very popular for making tube repairs. Over 10,000,000 punctures were repaired with them last year. No other method is so quick, safe, convenient and satisfactory.

Makes 4 Repairs in 5 Minutes

You can obtain garage size, Large Packages of Shaler Patch-&-Heat Units from your jobber, at prices so low as to make this the cheapest method of vulcanizing. There is no danger—no gasoline, no blaze, no flame, no trouble, no waiting to heat vulcanizer.

Prompt Shipment if You Order NOW

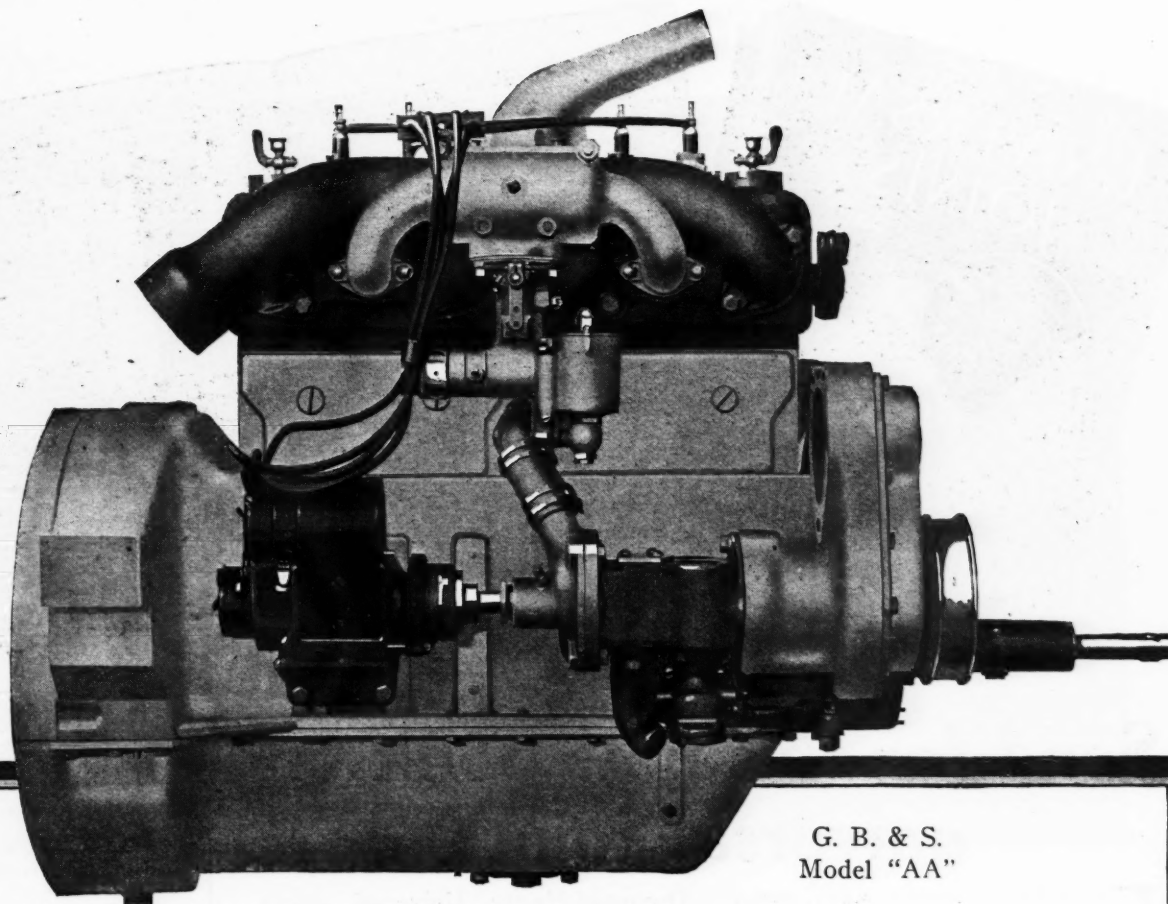
For months our factory was unable to keep up with the big demand for this wonderful vulcanizer. We have now enlarged our factory and increased its capacity—and can promise prompt shipment—provided you order at once.

Write Quick — or Ask Your Jobber

Our low List Price—\$10—is subject to 30 per cent trade discount, making the Net Price to you only \$7—and with the outfit we will send you Free Patches enough to more than pay for it, so that the outfit costs you practically nothing.

C. A. Shaler Company, 231 Fourth Street, Waupun, Wis.





G. B. & S.
Model "AA"

They all tell us we have been too conservative

Our factory, during the past three months, has been a veritable mecca for engineers and others interested in Truck and Tractor motors.

They are unanimous in declaring that we have been too conservative in our claims for this motor.

"It is one of the greatest motors ever built," says an engineer whose name we'd like to mention if business courtesy did not prevent."

This man watched it on the block—saw it perform.

But more, he was wonderfully keen and eager about every feature, and expressed particular appreciation of the thorough manner in which all details had been worked out.

The high power at moderate speed, adaptability to low grade fuel, the positive lubricating system, and the accessibility of every part, made a strong appeal to this engineer as it does to all others.

"Even the combustion chambers of this motor are machined so as to give precisely the same cubical content to every cylinder," remarked another visitor. "They certainly have gone the limit to produce a fine motor."

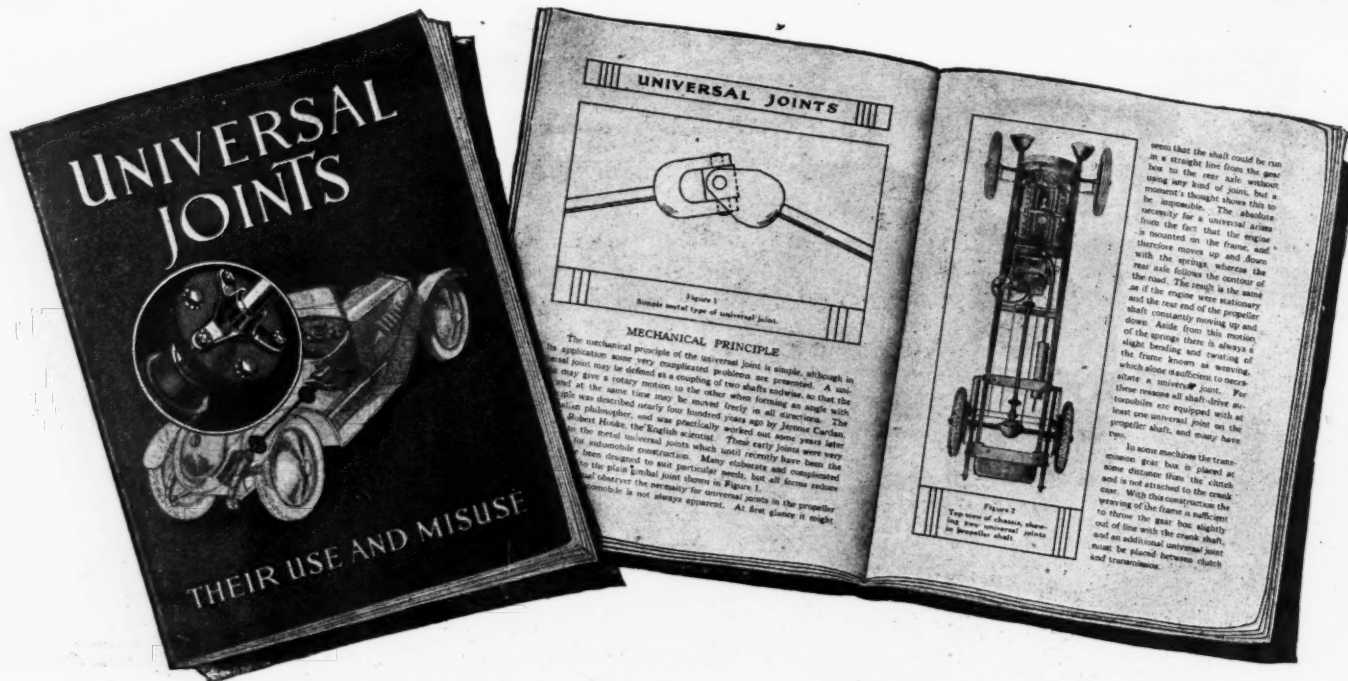
NOTE—Light weight—425 lbs.—makes this 3 $\frac{3}{4}$ x5" motor eminently suitable for high grade passenger cars.

*To get full information write for our
handsome catalog, or come to the factory.*

GOLDEN, BELKNAP & SWARTZ COMPANY
Detroit, U. S. A.

Export Dept.: 100 Broad St., New York—London—Paris

G-B & S motors



Send for this new book on universal joints

EVERY automobile dealer, owner, and garage man in the country should have this book. It gives complete information concerning the new principles of universal joint design, together with the opinions of prominent engineers and other valuable material on this important subject.

It describes in detail the development of the Thermoid-Hardy Universal Joint, and tells why fifty manufacturers of automobiles and trucks have adopted this coupling as standard equipment.

If you have not yet secured your copy write for it to-day.

Thermoid-Hardy Universal Joints have made good

For nearly four years Thermoid-Hardy Universal Joints have stood the most drastic tests for strength and endurance. They have given as high as 60,000 miles of continuous hard service without wearing loose or losing their valuable shock absorbing qualities.

Thermoid-Hardy Universal Joints need no protection, lubrication or adjustment. They are absolutely silent in operation and unaffected by the action of sand, mud, oil or water.

Insist that the car you handle be equipped with Thermoid-Hardy Universal Joints.

Thermoid-Hardy Universal Joints will make good—or WE WILL.

Thermoid Rubber Company

Sole American Manufacturers

Factory and Main Offices: Trenton, N. J.

New York Chicago San Francisco Detroit
Los Angeles Philadelphia Pittsburgh
Boston London Paris Turin

THERMOID-HARDY UNIVERSAL JOINT

Fanwise construction for strength

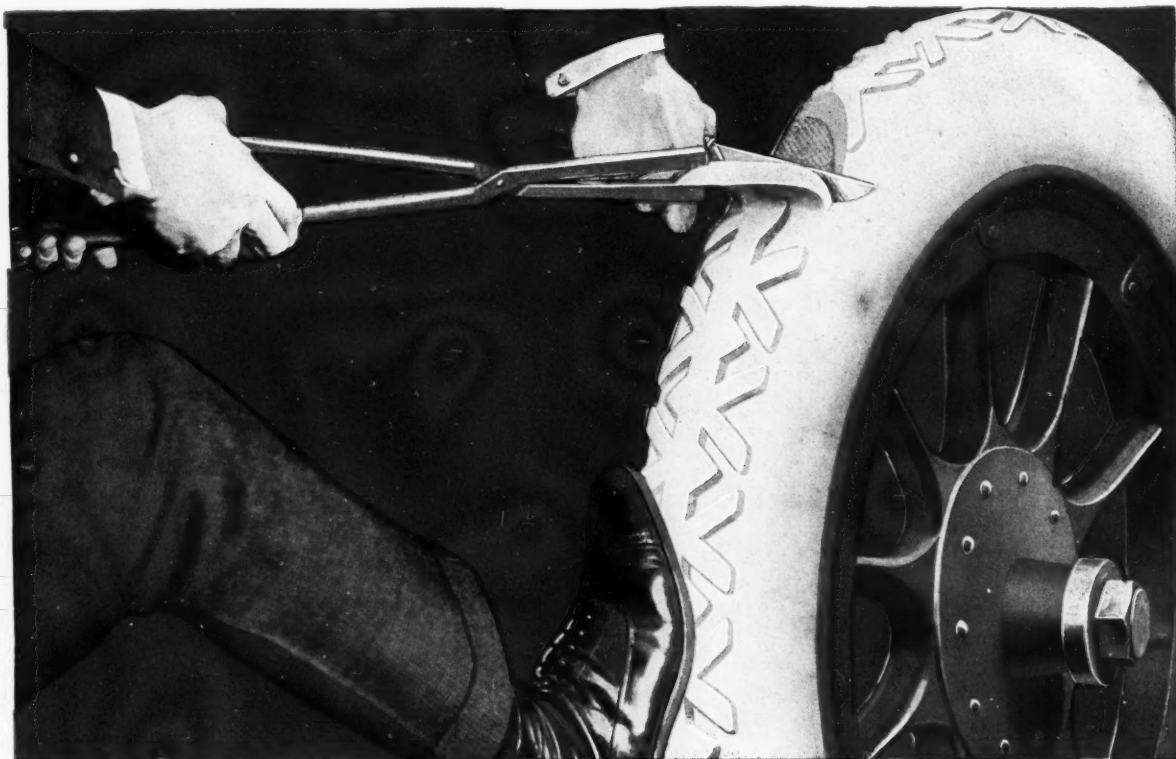
Makers of "Thermoid Hydraulic Compressed Brake Lining" and "Thermoid Crolide Compound Tires."



The layers are arranged fanwise, so that the strands of cotton in the various plies run in different directions. This patented construction gives the disc a uniform strength and elasticity which can be obtained by no other method.

List of users

Advance-Rumely Co.
Allis-Chalmers Mfg. Co.
American Motor Truck Co.
The Autocar Co.
Collier Co.
Crow-Elkhart Motor Co.
Dart Motor Truck Co.
The Dauch Mfg. Co.
Dixie Motor Car Co.
Doane Motor Truck Co.
Duesenberg Motors Corp.
Fageol Motor Car Co.
H. H. Franklin Mfg. Co.
Gramm-Bernstein Motor Truck Co.
Hebb Motors Co.
Hendrickson Motor Truck Co.
Hinkley Motors Co.
Holt Mfg. Co.
The Howard Co.
International Motor Co.
Kentucky Wagon Mfg. Co.
Lexington Motor Car Co.
Locomobile Co. of America.
Manley Motors Corp.
Menominee Motor Truck Co.
Mercer Automobile Co.
Moreland Motor Truck Co.
Nelson & LeMoon
E. A. Nelson, M. E.
D. A. New Comer Co.
O'Connell-Manly Truck Co.
Oneida Motor Truck Co.
Parker Motor Truck Co.
Reo Motor Car Co.
Root & Vandervoort Engineering Co.
Sanford Motor Truck Co.
Service Motor Truck Co.
Stewart Motor Corp.
Studebaker Corp.
Stutes Mar Tractor Co.
Templar Motors Corp.
Trego Motors Corp.
Twin City Four Wheel Drive Co., Inc.
Victor Motor Truck & Trailer Co.
Walter Motor Truck Co.
Ward-La France Truck Co., Inc.
Wichita Falls Motor Truck Co.
H. E. Wilcox Motor Co.
Zeitler & Lamson Truck and Tractor Co.



You can't pull the tread off a Thermoid Tire

"Intermediate" bond of Crolide Compound prevents Tread Separation—a common cause of shortened tire life.

AVERAGE rubber loses much of its original strength and elasticity during hard service, as is known by experience to practically every tire dealer and user.

Deterioration is caused by heat and friction.

Continuous driving, hot weather, the give-and-take over the road-bed, starting, stopping, turning corners, skidding, gear-shifting and accelerating—all cause heat and friction that result in the gradual disintegration of average porous rubber.

The tread, in a weakened condition, is then more susceptible to cutting and

chipping. Sand, water, and oil are gradually forced in. The final result is rapid tread wear, sand blisters, tread separation and kindred troubles.

Moreover, average rubber deteriorates (grows hard, brittle and lifeless) almost as rapidly through non-use as it does in service. "Age," as well as heat and friction, causes deterioration.

* * *

The distributor or dealer selling a line of tires that are subject to such faults is in frequent difficulty. If he has too many "come-backs," he throws out the line. Many dealers have gone through this process several times be-

fore finding a tire that stood up even reasonably well.

Such problems, of course, mean selling resistance, small percentage of repeat orders and loss of interest—in other words, unsatisfactory profits.

* * *

To prevent the faults developed in tires made of more or less porous rubber, the Thermoid chemists experimented for two years to find a substance that would seal up the small pores in rubber and yet not sacrifice resiliency.

This substance, Crolide, is compounded with Up-River Fine Para.

Crolide Compound Tires resist cutting and chipping. The tread is far tougher, and yet elastic. They wear down slowly and evenly. *They are immune from tread separation.* They show surprising mileage and economy. And they run *uniform* in quality.

The intermediate layer of Crolide compounded in a fixed ratio with pure Para makes a union of tread and carcass so strong that a man can't pull the tread off with blacksmiths' tongs.

TO THE TRADE

We have adopted what we define, a "selling" proposition. We recognize the fact that the trade can *sell* as well as distribute and have worked out the scale of profits accordingly.

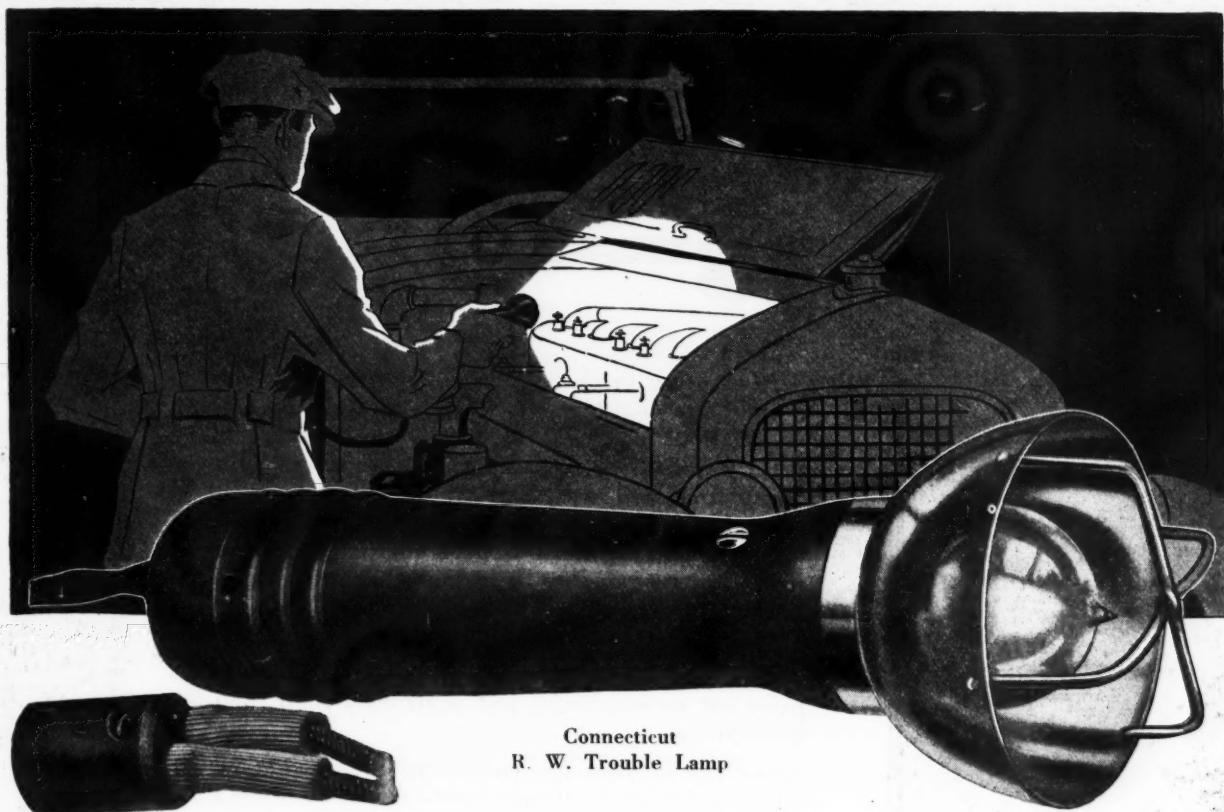
Write for full information about proposition.

If you are not making money on tires or if you are making money but want to make more, you will find the Thermoid Tire and the Thermoid Sales Plan interesting.

THERMOID RUBBER COMPANY
Factory and Main Offices, Trenton, New Jersey
New York, Chicago, Boston, Philadelphia,
San Francisco, Detroit, Los Angeles,
Pittsburgh, London, Paris, Turin.

Thermoid CROLIDE COMPOUND TIRES





Connecticut
R. W. Trouble Lamp

A Friend in Need

Everybody Needs a Trouble Light

IT is as much a part of a car's tool equipment as a pair of pliers or a wrench. Let engine trouble, tire trouble or any unforeseen mishap occur while driving at night, and a good Trouble Lamp is a real friend in need.

The Connecticut R. W. Trouble Lamp, illustrated above, is made up in a neat, substantial manner with a solid brass reflector, heavily nicked, and highly polished. A wire guard, so arranged that it can be collapsed for the removal or insertion of a lamp, protects the bulb against accident.

This lamp is fitted with a rubberoid handle and ten feet of black rubber covered Duplex cord, complete with attachment for plugging into lamp socket on dash.

The Connecticut R. G. Trouble Lamp is similar to the R. W., except that the bulb is protected by a high grade lens, which makes it, without doubt, the finest trouble lamp on the market.

Both the R. W. and R. G. Trouble Lamps are made with plugs for one or two wire sockets and each is packed in a tubular case with screw cover—the R. W. without the bulb—the R. G. with a six-volt, 4 C. P. light.



Connecticut
R. G. Trouble Lamp

CONNECTICUT
62 BRITANNIA ST.

TELEPHONE
& ELECTRIC

COMPANY
MERIDEN, CONN.

CONNECTICUT

Reg. U. S.



Pat. Off

TRED-WEL TIRES

Analyze the market for automobile tires—the market in *your own* territory—and you will find an insistent demand for quality at a moderate price. This demand cannot be satisfied with cheap tires; too many car owners have found out that cheap tires give cheap service. Your average customer will not buy poor quality at a cheap price, but he *will* buy high quality at a *moderate* price.

Tred-Wel Tires are built expressly to take care of that demand. We emphasize their moderate price but we emphasize just as strongly their high quality.

Every one of your tire customers knows what he wants and what he should have. What he doesn't know is where and how to get it. Let him know just what kind of tires Tred-Wels are, show him he can buy quality without paying a premium for it, and you have made a sale as well as a satisfied customer.

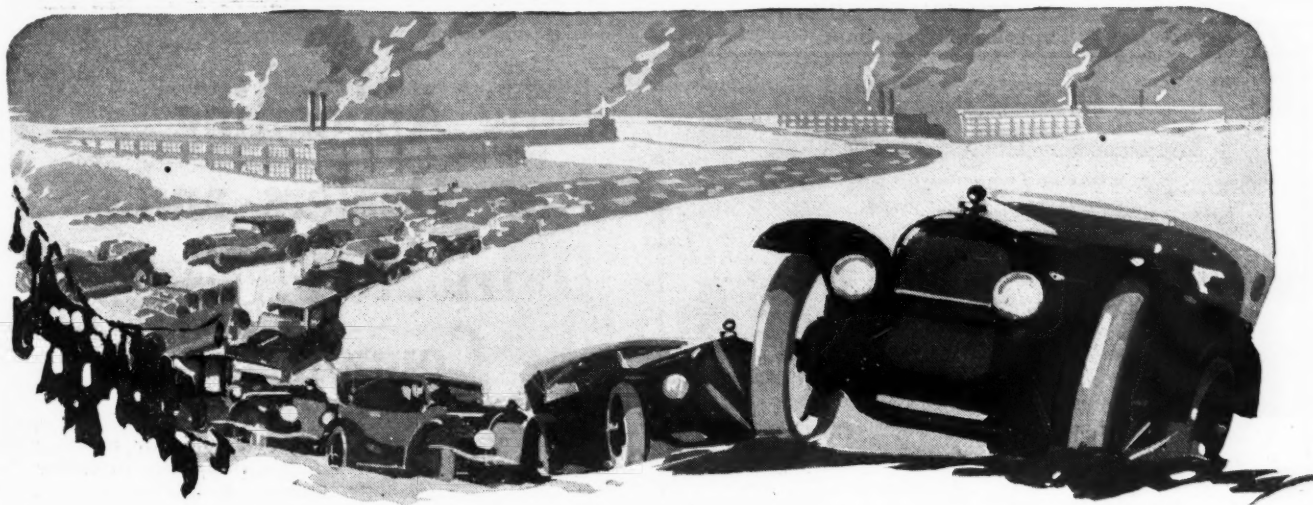
Our sales proposition goes into details. Write for the complete plan.

TWIN AND RUBBER CO

1002 Michigan Ave.

Chicago, U. S. A.





Campbell Fan Belts



This is the famous Latigo Fan Belt for Ford Cars. It is made of genuine latigo leather and is impervious to heat, oil and water. Friction cannot burn it, wear cannot harden it and it will not stretch or slip.



The new reinforced Latigo Fan Belt is made of special waterproof ducking, scientifically folded and stitched to latigo leather with rows of heavy thread stitching. Wonderfully durable.



The Campbell Corded Fan Belt for Ford Cars is a really non-stretchable belt. It is made of waterproof canvas interwoven with a series of eight cords and then stitched to leather for pulley facing. Will not stretch or run off.



The Campbell V-Shaped Latigo Belt successfully meets the demand for a belt of this kind. It is made of three plies of heavy latigo leather and held together with leather thongs. There is no chance whatever of ripping.

A Million New Cars Need Seat Covers

More than 1,900,000 cars were manufactured in 1917. Automobile authorities say as many more will be produced this season.

A large number of these will be sold in your territory.

And every one represents a possible purchaser of Campbell Detachable Upholstery.

Can you think of any other automobile accessory for which there is a better market?

This Seat Cover De Luxe will secure for you the lion's share of this seat cover business.

And here's a feature that will appeal to you. With Campbell Detachable Uphol-

stery it isn't necessary to carry a large stock of goods on your shelves to go out of style next season. You sell from a sample book. No capital tied up. No risks to run. No other accessory offers as fine an opportunity for quick and sure profits.

This seat cover has style, refinement and elegance. It is made of the finest fabrics and fits as snugly as a tailored suit. Interiors fitted with it acquire a smartness that is a never ending source of pride to motorists. It is nationally known as the Seat Cover De Luxe.

This is the season when the buying of motor cars is at its peak. Write us and secure your agency now, so that you can make the most of this great market.

The Perkins-Campbell Company

625 Broadway

Cincinnati, Ohio



Campbell

ESTABLISHED 1879

DETACHABLE UPHOLSTERY

When Writing to Advertisers Please Mention Motor Age

What A Prominent User Says

CHAS. W. PARBRIDGE, Pres.

EDWARD HILLMAN, Secy

HILLMAN'S

IMPORTERS-JOBBERS-RETAILERS

 NEW YORK
 404 FIFTH AVE.
 PARIS
 128 RUE CHATEAUVILLE

STATE AND WASHINGTON STS.

CHICAGO, May 31, 19

COMPARATIVE FIGURES SHOWING

COST OF OPERATION OF FORD CARS WITHOUT WESTERN KEROSENE CARBURETORS

March 1917	Days at work	Gasoline used Gal.	Fuel Cost	Fuel Cost per day
# 98	13	57	\$16.53	\$1.271
99	20	171	32.49	1.241
102	25	185	35.15	1.406

Average Fuel Cost per day per car \$ 1.306

March 1918	Days at work	Gasoline used Gal.	Kerosene used Gal.	Fuel Cost	Fuel Cost per day
# 98	26	7	130	\$ 15.22	\$.584
99	26	10	153	16.17	.698
102	24	9	131	16.74	.697
106	21	8	111	13.34	.635

Average Fuel Cost per day per car \$.654

We have equipped our entire Ford fleet with these carburetors and they have proved satisfactory and practical both in summer and winter. We are pleased with the results.

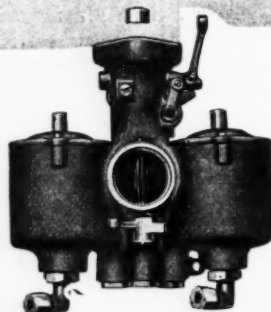
Yours Truly

HILLMAN'S
PER
J. R. Gelligan
Per Agt.

ABOUT



Used by

 Chicago Telephone Co.
 Libby, McNeill & Libby
 Boston Store
 Swift & Co.
 Hillmans'

 Cosgrove Brewing Co., Ltd.
 Evel Casket Co., Ltd.
 Toronto Daily News
 Portland (Ore.) Sunday Journal

WESTERN

Dual Fuel

CARBURETOR

For Fords

The demand for WESTERN CARBURETORS—the acceptance of them—the profits that go with them make it worth the while of every dealer and distributor to be acquainted with them. The coupon will put you in touch with the new business WESTERN CARBURETORS can bring you. Mail it to us today.

WESTERN CARBURETOR CO.
ALMA MICHIGAN

Now Appointing New Dealers and Distributors! Use the Coupon

Our big new factory is now building enough Western Carburetors to assure immediate delivery to all our present dealers—and to every other dealer who is looking for a good money-making product. Every owner of a Ford passenger car, delivery car, truck or taxicab is a waiting prospect. WESTERN Carburetors cut fuel bills in half—read Hillman's letter.

There never was a better kerosene carburetor made. Big users everywhere, have given this carburetor every possible test, and their most enthusiastic endorsement. You can't beat it—and a Ford equipped with a Western Carburetor can't be beaten—it eats up hills, astonishes with additional power, and puts every Ford car used for business and commercial purposes on a better paying basis.

From a standpoint of construction, the Western Carburetor is the most logically designed and perfectly built carburetor on the market for Fords. This design offers two carburetors in one—the kerosene carburetor is conceded to be the most practical of its kind—and the gasoline carburetor is equal to the finest Ford Carburetor built.

Sold on 15-Day Trial— Money Back If Not Satisfied

Western Carburetors are sold on a 15-day trial basis. If they do not prove absolutely satisfactory in every way, we refund payment immediately together with carrier charges. Use the coupon for trial carburetor offer and sales proposition.

Western Carburetor Co.,
Alma, Michigan.

Kindly forward complete literature describing the WESTERN CARBURETOR, together with your selling plan for DEALERS and DISTRIBUTORS.

Name

Address

Keep the Wind-
shield Clear



A Chemical De-
vice for Rainy
Weather—Price
\$1.00

TRADE MARK RAINY RACER SCIENTIFIC

INSURE your safety and comfort! Don't go driving without this wonderful new discovery in the pocket of your car.

It breaks up the raindrops by a chemical agent which does not collect dust or dirt, or injure the varnish, does not have to be applied like grease compounds, and does not clutter up the windshield with special devices.

As soon as the first drops of rain strike the windshield, rub the Rainy Racer over it as if rubbing the rain drops off. The moisture of the rain dissolves a very small quantity of the active chemical with which the wick is impregnated. This immediately breaks up the rain drops, causing them to spread in a thin film of water, making the windshield crystal-clear. One application of the Rainy Racer will last as long as the rain. It is absolutely impossible for the hardest rain to wash off the chemical after it has spread over the glass. This means that as long as you drive, your windshield will be perfectly clear, thereby eliminating the annoying rain drops which ordinarily stick tight to the windshield and dance before the eyes. The Rainy Racer is properly constructed along sound scientific lines and will absolutely accomplish the desired result. There is nothing to renew, no new chemical to buy, nothing to get out of order. It will last a life time.

DEALERS! Note These Six Points.

- 1—There is a well organized demand for a practical windshield cleaner which does not clutter up the windshield with a special device and is not a greasy dust-collector.
- 2—Rainy Racer is priced at \$1.00—much less than the ordinary windshield cleaning device—and has the advantage of being very simple and does not have to be attached to the windshield.
- 3—It is covered by an absolute iron-

- bound guarantee to do the work.
- 4—Discounts are liberal so that you make a good profit and still offer the device below the price of the ordinary windshield cleaner.
- 5—It is manufactured by a strong company and the sales campaign is backed by a national advertising campaign in the leading motor magazines. Counter-displays and other advertising material are furnished.

- 6—Rainy Racers are now being turned out in large quantities and we can make immediate delivery. Get in at once on this new device and be ready to meet the demand. Either ask your jobber or write today for our proposition. Send a dollar bill for a sample device. The regular dealer discount on this sample will be credited against your first order.

RAINY RACER COMPANY

Office and Factory: 3-5 East Redwood Street, Baltimore, Md.



THE ORIGINAL PITTSBURGH VISIBLE SPARK PLUG

WITH EXCLUSIVE ADJUSTABLE SPARK GAP

Every feature of this sturdy "troubleless" plug is a selling feature. You do not have to put it over the counter on vague, unproved superiority claims. *There is a reason* back of every construction point.

The "visible spark" which may be seen at a glance shows perfect ignition, poor ignition, or if the little window is dark, a dead cylinder. The spark gap also acts as an intensifier and absolutely precludes carbon formation.

The spark gap is adjustable and is an exclusive feature in this plug. It is the greatest improvement ever made on a spark plug. Adjust while the engine runs.

The plug is rugged and built to endure hard knocks. We use only 775 Porcelain, known as the best the world produces. The terminal rod is

Mica Insulated Short Circuit Proof

and in this form of construction there can be no compression leak.

The above is the "selling formula" of the Original Pittsburgh Visible Spark Plug. Car owners will see its value at a glance and buy it for the service it promises and performs.

We offer liberal discounts to hustling dealers and distributors—also exclusive territory which may be turned into a highly profitable field for those who know a good spark plug—and who want to sell it. Write for full information.

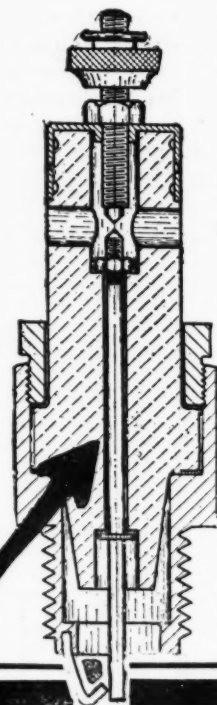
Added attraction—We pay the war tax.

We also have an attractive JOBBER PLAN. Get the details.

Retail Price—\$1.50 each

Sold direct postpaid on receipt of price if dealer does not handle

Pittsburgh Visible Spark Plug & Mfg. Co.
460-68 Melwood Ave. Pittsburgh, Pa.



LET This Quality Oil Help Build Your Sales

Good oil often accounts for all the difference between an engine that is alive and full of pep and one that is sluggish, dead and wasteful of oil and fuel. In other words, it accounts for the difference between a pleased and a dissatisfied customer.

A proven Quality Oil guards against sluggishness and power loss, against worn parts and loose bearings. It stalls off repairs and replacements—a consideration more important today than ever before.

Therefore, as a careful dealer, you should always recommend



Motor Oil

Backed by a half-century's reputation, used extensively in Pennsylvania where it is produced and refined by the Crew Levick Company's own works, this Quality product is available now to all who realize that efficient operation and long-time service demand superior oil. You can get it for your customers.

Crew Levick Motor Oil is refined exclusively from Pennsylvania Crude—the highest priced crude today, and admittedly the best base for motor oil.

Leave ordinary oil to the other fellow; pick a Quality Brand for yours. Sell genuine Crew Levick in sealed containers, or if you prefer, in half-barrels or barrels. You will save your customers trouble and expense, and make your reputation secure.

WRITE FOR OUR PROPOSITION

Crew Levick Company

(Subsidiary Cities Service Co.)

117 North Broad Street

Philadelphia, Pa.

Branches: New York, Boston, Baltimore, Chicago,
Syracuse, San Francisco

Sold in one-gallon and five-gallon
cans, half-barrels and barrels



When Writing to Advertisers, Please Mention Motor Age

Goodrich

MOTOR TESTING VALVE

Cylinders That Miss, Steal Gas—

Test Your Motor Before You Drive

BEFORE you leave the garage be sure that your motor is working as it should. The scientifically constructed Goodrich Motor Testing Valve will tell you instantly if all cylinders are working properly.

When the valve is opened every pulsation of the motor is distinctly heard and any irregularity of the motor is revealed at once.

The bell mouth opening of the Goodrich Motor Testing Valve produces a loud, clear, sharp note and allows for ample expansion of the gases, relieves the motor of all back pressure and greatly intensifies the sound of each explosion.

It is so simply constructed, so strong, so easily installed, so impervious to hard knocks, and adverse conditions—that it is indispensable on all cars whose drivers want to know at all times how their engines are performing. Guaranteed to last the life of the car without sticking, slowing up, carbonizing or giving trouble of any kind.

DEALERS everywhere are selling more Goodrich Motor Testing Valves each month. If you are not selling your share ask your jobber—or write us.

Ford Size—List Price \$1.75, including Pedal, Pulley and Cable. Made in 15 sizes for all makes of cars and trucks at corresponding prices. Ask for booklet.

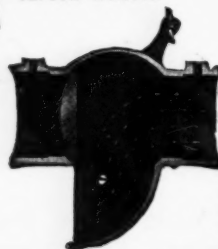
GOODRICH-LENHART MFG. CO.

419 Widener Bldg., Philadelphia, Pa.

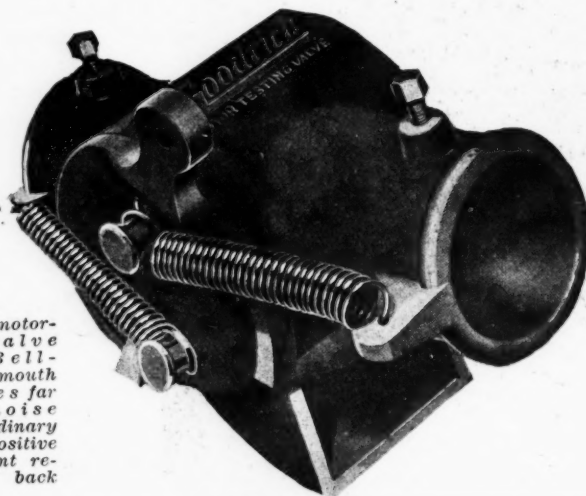
Factory, Hamburg, Pa.



Showing motor-testing valve closed. Revolving shutter with knife edge absolutely prevents carbon trouble.



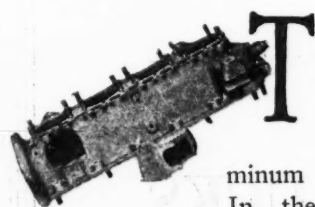
Showing motor-testing valve open. Bell-shaped mouth produces far louder noise than ordinary cutout. Positive and instant relief from back pressure.



When Writing to Advertisers, Please Mention Motor Age

When C. W. Adams Took On Aluminum Repairing He Added \$385 to His Income in One Month, And His Business Is Growing Rapidly

If You've Got an Old Hack-Saw Blade, a Gasoline Torch, 5 or 10 Pounds of Peters' Aluminum Brazing Solder and an Average Amount of Common Sense, You Can Build a Big and Profitable Business Easily and Quickly



THERE is an incessant demand for aluminum repairs.

In the past a broken aluminum part had to be replaced, at a heavy cost. A new crankcase, for instance, would mean upward of \$75.

With Peters' Aluminum Brazing Solder you can repair any broken aluminum part—*perfectly and permanently*—save the car owner 50 or 60 dollars, and make a handsome profit for yourself.

Though the average repair can be made very quickly, and requires but a small amount of material, you can get a big fee for the work *because you save your customer the far greater cost of a replacement.*

You'll find hundreds of such repairs to do in a motoring season—and car owners will flock to your place to save money on new parts. Other repairmen will gladly turn over their aluminum jobs to you, *to get them done right.*

The Use of Peters' Aluminum Brazing Solder Requires No Special Knowledge or Skill.

A few hours' practice will make you an expert. As one garageman put it, "it's as easy as buttering bread." It requires no special tools or equipment

—a gas, gasoline or oil torch, and an old hack-saw blade or similar tool are all you need.

We'll Help You Get Started

If you buy even as little as a pound of Peters' Aluminum Brazing Solder, we'll show you not only how to use it, but how to get business from car owners, other repair shops and garages. A complete plan, including announcements, business-bringing letters and circulars, based on the suc-

cessful experiences of our customers, will be mailed on receipt of your order or inquiry.

Now bear in mind that this great business-building opportunity requires only a trifling investment—*less than any other business you could engage in.* You can start with only a pound of solder, if necessary—at a cost of \$3.50.

If you don't get after this business, someone else will. Don't wait! Write today for full particulars.

ALUMINUM BRAZING SOLDER COMPANY

260 Montgomery Building, Chester, Pa.

**PETER'S
ALUMINUM
BRAZING
- SOLDER**



Aluminum Brazing
Solder Company,
260 Montgomery Bldg.,
Chester, Pa.

Please send me full particulars about the
Aluminum Repair Business.

Name

Address

When Writing to Advertisers Please Mention Motor Age

Don't Make the Mistake of Waiting Too Long

The time to make your final selection of the truck you are going to sell permanently is **right now**. Delay may lead you into dangerous paths because the truck that is available for your consideration now may not remain long unrepresented in your territory.

From the standpoint of your success, the best truck for you to sell is not necessarily the best known truck at present. Your final decision should be based on the truck itself, what it has done in the past and what you feel sure it will do in the future. If you feel you are not selling as many trucks as you should, find out **why**. You will probably find the reason in the truck itself. If the truck you are now selling does not meet the conditions in your territory, take on a line of trucks that does meet the conditions.

If you are not selling trucks but think you should, make your selection **right now**. Delay is your most dangerous competitor. Make the truck the basis of your selection. Decide on a good truck and your business will be good. And the best way of passing on the merits of a motor truck is to find out what it has done in the past.

Make up your mind to decide—and then decide **right now**.

Send for complete details of our dealer proposition covering Reliance Trucks.

Reliance

EVERY INCH WORTHY THE NAME

MOTOR TRUCKS

1½—2½ Tons

SPECIFICATIONS

MOTOR—The well known Buda Heavy Duty Truck Motor.

TRANSMISSION—Fuller Transmission in unit with motor.

CLUTCH—Multiple disc dry plate clutch.

CARBURETOR—Stromberg.

IGNITION—Bosch Magneto with Steering column control.

BEARINGS—Front and rear axles equipped with adjustable taper roller bearings.

UNIVERSAL JOINTS—Hartford joint, extra large size.

FRAME—Pressed steel, larger section than ordinarily used on trucks of same capacity.

SPRINGS—Sheldon alloy steel springs.

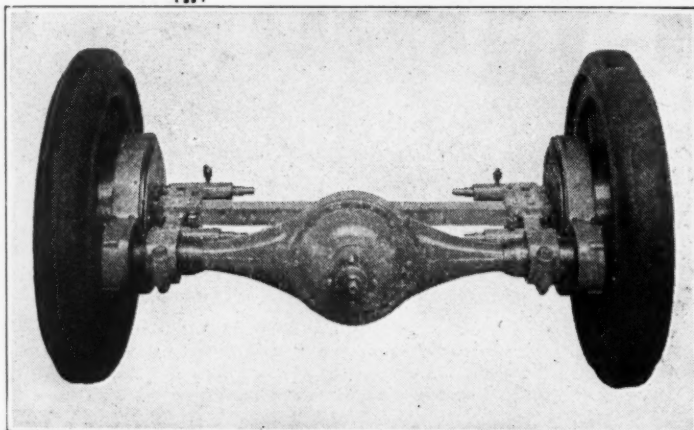
STEERING GEAR—Ross steering gear.

RADIATOR—Built up type, carried on ball trunnions.

CONTROL—Left hand drive, center position of levers.

REAR AXLES—Badger external spur gear axle on all models.

Badger External Spur Gear Axle



The gears are fully enclosed and run in grease. All gears are cut in our own plant out of nickel steel, heat treated, and will outlast any other type of drive. Entire weight of load is carried on a dead axle, relieving the differential housing of all load strains.

Reliance Motor Truck Co.

APPLETON

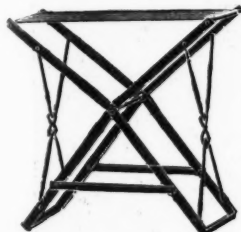
WISCONSIN

DEALERS—It's Easy to Sell

BOKO

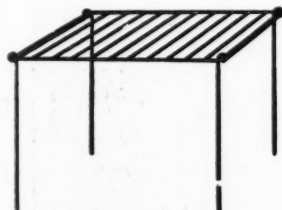
PRO COLLAPSIBLE PRODUCTS

Manufactured by
Defiance Welding Co. — Defiance, Ohio



The Boko Folding
Steel Stool

Cat. No. 1100.
Each\$1.25



The Boko Camp
Grate

Cat. No. 1110
Each\$0.75

Cat. No. 1112
Each\$1.15



The Boko Bucket
For Gasoline or
Water.

Without Funnel
Cat. No. 1507
Each\$1.00

It's the little conveniences which make motoring enjoyable. BOKO products are worth their weight in gold to the motorist—and they sell accordingly.

The BOKO Folding Steel Stool is strong and durable. For the convenience of an extra seat it pays for itself over and over. BOKO Buckets may be used for either gasoline or water. They are built of gasoline proof fabric double sewed and tightly cemented. When not in use as a funnel the flexible tube fastens over the top. No waste. No spilling. This bucket folds and can be placed in the tool kit or under the seat. BOKO Buckets are furnished either with or without funnels.

BOKO Wash Aprons are made of extra quality rubberized fabric—very serviceable and substantial. BOKO Battery Aprons are really acid proof.

Dealers

Dealer discounts on Boko Products are unusually interesting. Order from your jobber or write us direct

Sales Department

The BAILEY-DRAKE COMPANY, Inc.
1120 Michigan Avenue Chicago



Boko Aprons

Cat. No. 1545
Each\$2.00



The Boko Bucket

For Gasoline or
Water

With Self-Contained
Funnel

Cat. No. 1500
Each\$1.75



Folded



When Writing to Advertisers, Please Mention Motor Age

TRIPLEXD

TRADE MARK REG. U. S. PAT. OFF.

Every Length Guaranteed for One Year's Service

This Length of Hose Has Been in Service Over Three Years—

*and is still delivering
clean gasoline*

IT has been in use since April, 1916, on one of a pair of Triplexd equipped portables belonging to H. Kergman, 2011 Foster Ave., Brooklyn, N. Y. It was photographed May 16, 1919. It is an example of the service capacity behind the Triplexd Guarantee*.

Since last March this hose has delivered 14,834 gal. of gasoline. For three years it has worked in the open in all weathers. It is still leak-proof and delivers gasoline free from rubber sediment. The only signs of wear are the taped portion where the fabric has been worn by chafing against the tank.

METAL HOSE & TUBING CO.
INCORPORATED
235 Tillary St.
BROOKLYN, N. Y.

*Triplexd is guaranteed for one year's continuous service. Its average life is over two years.

**SERVICE
GUARANTEE**
We guarantee this length of hose to give one year's continuous service covering gasoline. This guarantee covers all years except those due to accidents or willful damage. It does not cover defects in the filling out and mailing to us of the enclosed registration card. METAL HOSE & TUBING CO. N. Y.

TRIPLEXD

When Writing to Advertisers, Please Mention Motor Age



*"I like this carton idea
the GILMER people have originated"*

"... it keeps the stock clean, saves space on the shelves and is handy,"—these are almost the exact words used by a dealer in commending the new sales-help carton containing Gilmer Woven Endless Fan Belts.

The grouping of Gilmer Belts that fit several makes and models of cars in one package, each carton containing twenty-five belts, enabling a dealer to supply most popular cars by carrying just a few cartons, are other reasons why dealers are gladly stocking the Gilmer line.

Of course the most important reason for a dealer stocking Gilmer Belts is because they *move fast*. And the reason they sell so easily is because they give service and are well known.

Eighty per cent of all cars made leave the factory with a Gilmer Woven Endless Fan Belt. And it is much easier to sell a man something he already knows than to try to get him to experiment. From now on every belt will be branded with the name Gilmer and the group number in clear, easily read stenciling. There are cheaper belts than Gilmer—but none better.



L. H. Gilmer Co.

Factories

Philadelphia, Pa. Allentown, Pa. Chicago, Ill. Detroit, Mich.
North Wales, Pa. Millen, Ga. Milwaukee, Wis.

Branch Offices

Gilmer
WOVEN ENDLESS
FAN BELTS

When Writing to Advertisers, Please Mention Motor Age



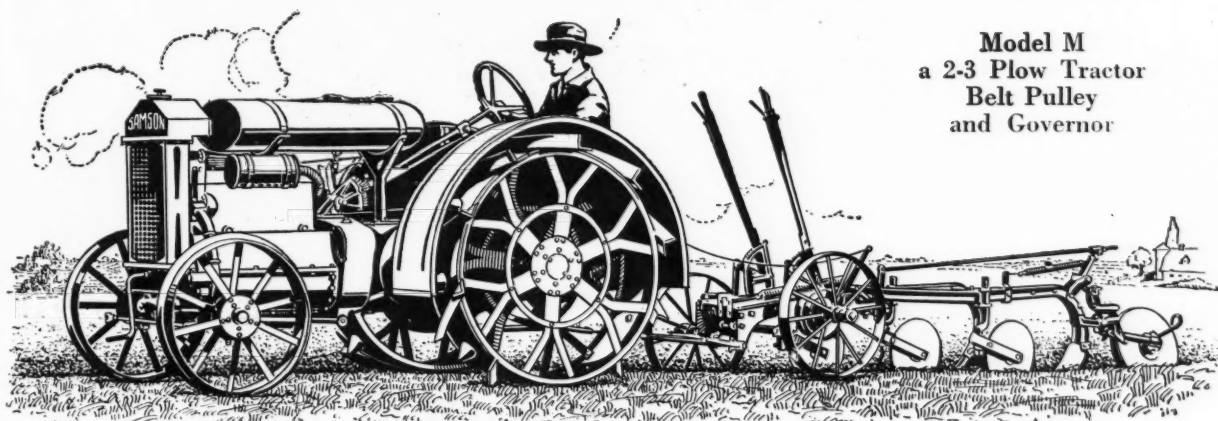
AN ancient philosopher has said that "A man's praise has very musical and charming accents in another's mouth, but is very flat and untunable in his own."

Possibly two hundred makes of tires are advertised as "best." We rest our case on the judgment of the man who uses Kellys. Ask him



When Writing to Advertisers Please Mention Motor Age

SAMSON TRACTOR



Model M
a 2-3 Plow Tractor
Belt Pulley
and Governor

Prices Equal Value—a New Idea in Tractor Sales

Samson Tractors are sold on the idea that price and value should be practically equal.

The value of a tractor to the farmer depends mainly upon the number of horses he can sell after he buys it. The price he pays should not be much greater than the saving he makes in horses, harness, and feed.

The Samson Tractor is sold on that basis.

Can you think of any fairer, squarer selling policy—of any way to build a more sound, more permanent business?

Yet in addition you have the other tractor selling arguments—the saving in time and labor, the doing of work at the right time and doing it better, the increased acreage made possible.

This policy—that horse displacement is the great

determining factor in tractor value and hence in tractor price—is new in the tractor industry.

New, too, are Samson policies in regard to Dealer service to tractor owners, in the terms of our Dealer's Contract, in the demonstration of a Samson Tractor right on the farm of the purchaser.

These and other innovations are set forth in "The Samson Tractor Story," a little book just off the press.

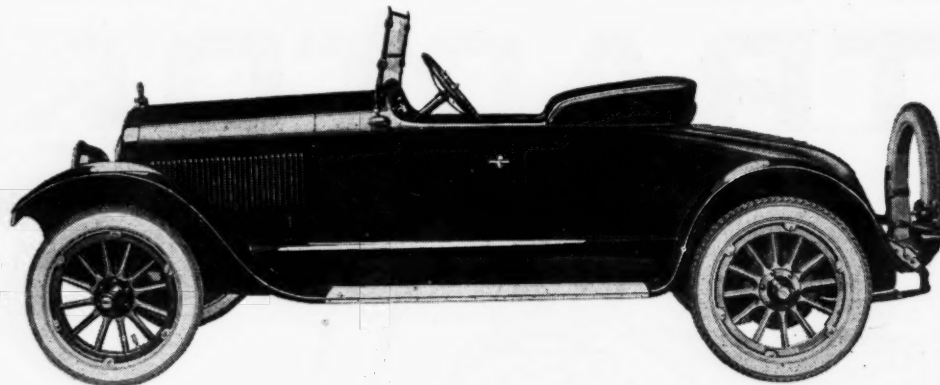
If you believe in the policies set forth here, if you are interested in learning more, write for that book and for our Dealer's proposition in full.

The Samson Model M Tractor is a 2-3 plow tractor and sells for \$650, f. o. b. Janesville, Wis. This price includes belt pulley and governor, but no service to the user. Platform and fenders, \$50 additional.

SAMSON TRACTOR COMPANY

Makers also of Samson Model D Tractors and Samson Trucks

125 Industrial Avenue, Janesville, Wisconsin



STEPHENS *Salient Six*



"That is salient which is strikingly manifest or which catches the attention at once."—*Webster.*

Again the Stephens Salient Six has won the Los Angeles Economy Run. This year it traveled 21.4 miles per gallon of gasoline and won over all water cooled cars by a 5 five-ton mile margin. In 1918, the Stephens Salient Six made 21.5 miles per gallon of fuel and won over all cars entered for economy of fuel, oil and water.

These records establish the Stephens Salient Six as the most economical motor car in its class.

The superiority of the Stephens Salient Six is due chiefly to the Stephens perfected overhead-valve engine, which contains a superior fuel preparing and handling system that not only makes the Stephens Salient Six the most economical, but the most powerful engine of its size.

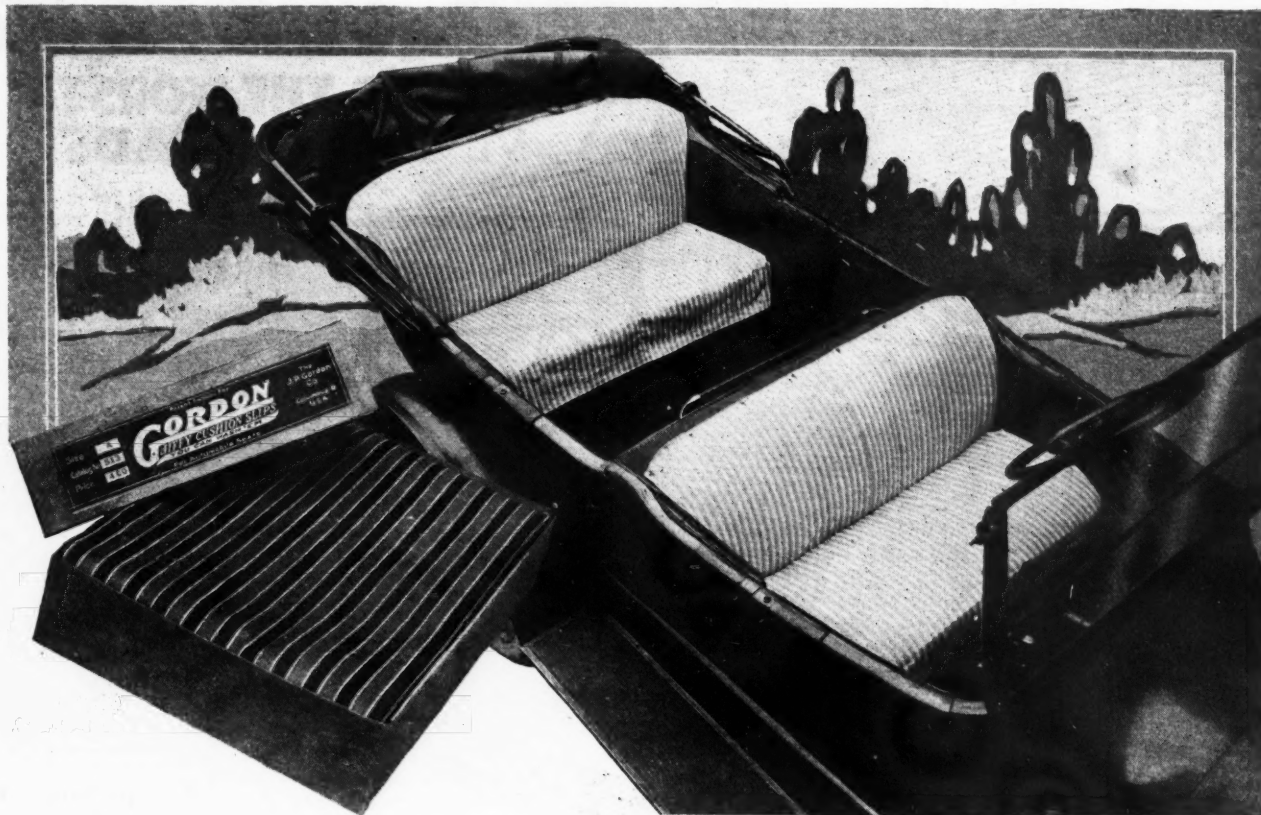
Inspection will reveal numerous other features which make the Stephens the "Salient" Six.

Moline Plow Company

Stephens Motor Works

Sales Office: Moline, Ill.

Factory: Freeport, Ill.



Washable Cushion Slips!

One-Piece—Easily Put On—Stock Sizes

GORDON Jiffy Cushion Slips are ready to put on, instantly removable, and easily laundered. They are made of stoutly woven, pre-shrunk materials.

The cushions you sit on and lean against—where all the soil and stains come from—are attractively covered by these one-piece cushion slips. And their big-value price guarantees quick sales!

They wash as easily as any simple garment without shrinking or fading. They come from the laundry as fresh and clean as they were bought. They are easy to attach and take off. "Button hole" them on as you would any garment.

They are new—and *right*. Their popularity is best evidenced by the many re-orders that are pouring in from all over the country. This fact establishes, beyond a doubt, their sales possibilities. GORDON Jiffy Cushion Slips are made in twelve

GORDON
JIFFY CUSHION SLIPS
YOU CAN WASH 'EM

\$2.50 to \$5.00 Per Set For Open and Enclosed Cars

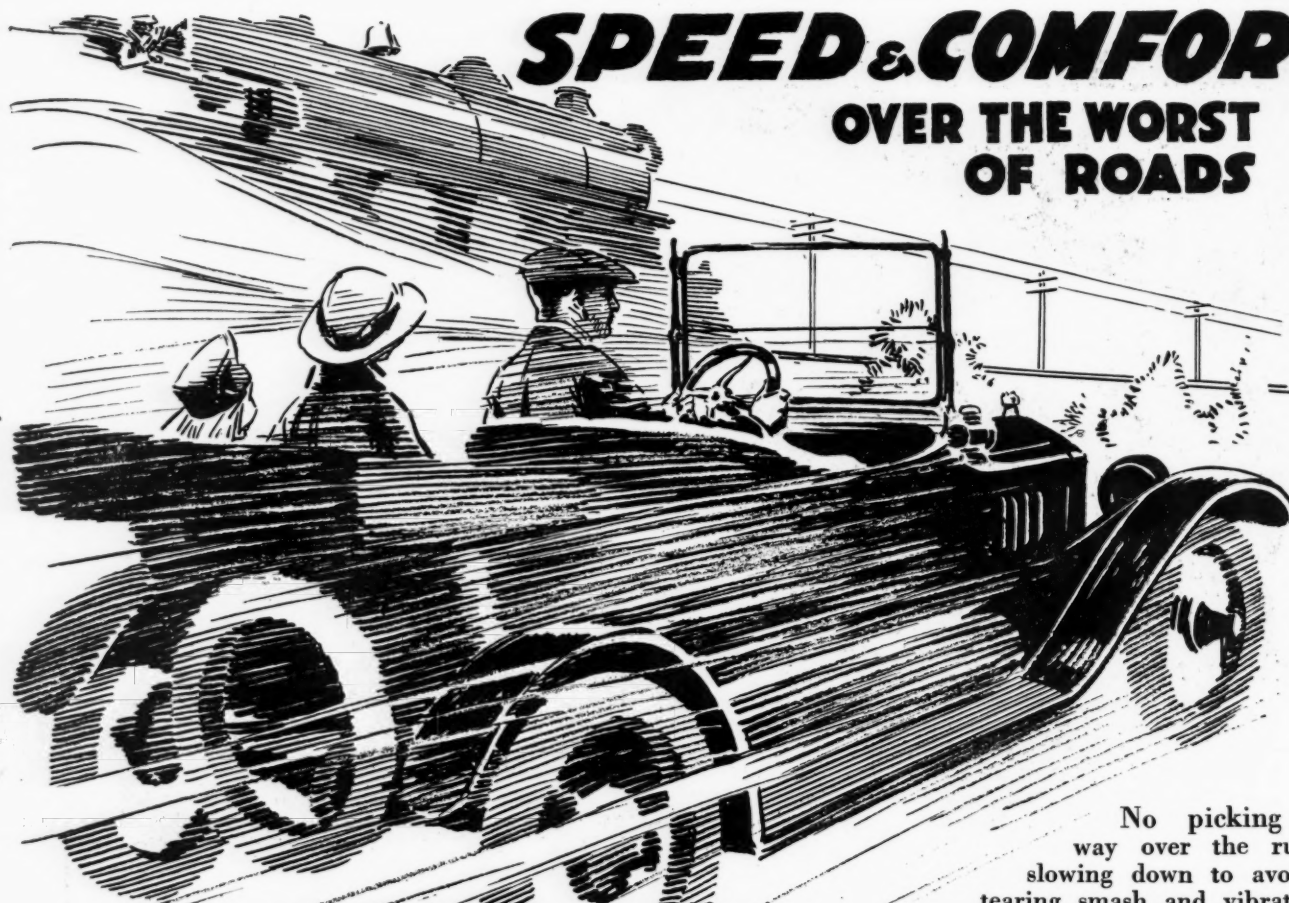
sizes—nothing special. Just pull them off the shelf, ready to go on the car. Each size is used for dozens of cars. Packed one in a neatly labeled box, showing size, material number, and price, and each box contains an alphabetical list of cars, giving the size to use on each seat of any car. The customer can put them on himself—without your help. Write for samples of materials and full particulars of our dealer proposition.

The J. P. Gordon Company

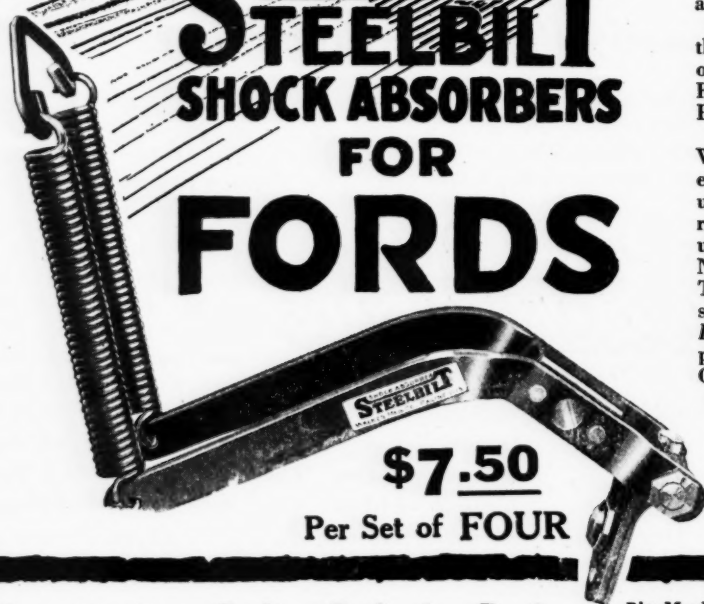
308 North Fourth Street,

Columbus, Ohio

Manufacturers of Seat Covers, Tire Covers, Top Coverings, Radiator and Engine Robes, and other fabric equipment for automobiles.



WALKER STEELBILT SHOCK ABSORBERS FOR FORDS



\$7.50

Per Set of FOUR

No picking your way over the ruts—no slowing down to avoid the tearing smash and vibration of rough spots for the driver whose Ford is equipped with Walker Steelbilt double arm cantilever Shock Absorbers.

Walker Steelbilt Shock Absorbers for Fords are all that the name implies—*Shock Absorbers*. They smooth out the roughest going—soak up the shocks—cradle a Ford in an easy big-car sway. They protect the car. Protect its occupants. Then protect *themselves*.

Built entirely of steel. Absolutely unbreakable. Wear-proof. Outlast car—and add to its life. Spring extra long—oil tempered—greatest elasticity—with utmost durability. Spring bolts turned from cold-rolled steel and hardened—equipped with oilers. Free unhampered action given to both coils and leaf springs. No sliding parts. No sign of a squeak. No breakage. Thoroughly safe. Strong as steel can be in every section.

Big Saving in Cost over inferior devices. Only \$7.50 per set of four.

Complete. Ready for immediate installation. No holes to bore. No special tools. No trouble. Guaranteed satisfactory in service. Tremendous demand. Write for prices and descriptive matter.

Walker Mfg. Co.

32 Hamilton St.

Racine, Wisconsin

Walker Auxiliary Radius Rods for Fords

Patented Walker Auxiliary Radius Rods for Fords act as reinforcement for regular Ford Radius Rod. Brace front axle. Keep it straight. Abolish bending and breakage. Ready for instant installation. No holes to bore. Clamp right on to rear of regular rod—fasten to axle—employing regular Ford Perch bolt except 701, which clamps to front axle. Write your jobber for prices. If he refuses to quote them—write us. **Patented**



No. 701—Made of solid $\frac{3}{4}$ -in. steel rods. Malleable clamps. Weight 12 lbs.



No. 702—Made of 1-in. x 1-in. x $\frac{3}{16}$ in. angle iron. Weight 8 lbs.



No. 703—Made of 1-in. x 1-in. x $\frac{1}{2}$ -in. angle iron. Jointed arms. Weight 5 lbs.



No. 704—Made of $\frac{1}{2}$ -in. tubing. Malleable threaded clamp. Weight 5 lbs.



Don't! just advertise "AIR"
-- Say "Long Stroke" AIR

"Twice As Fast"

with a
"Long Stroke"
Compressor

*So the motorist will know
he'll get his tires filled--
"Twice As Fast"*

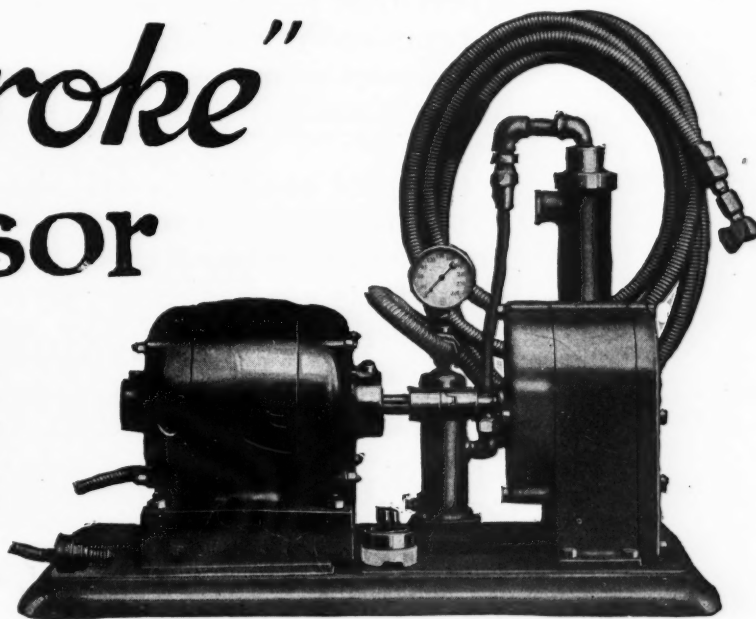
JUST LOOK AT THIS TABLE -

You can fill a	From flat to	In
30 X 3	60 lbs.	28 sec.
30 X 3½	70 lbs.	49 sec.
35 X 5	90 lbs.	150 sec.

The "Long Stroke" Compressor

It is a mighty strong drawing card to be able to inflate a customer's tires in just half the time. That's his idea of SERVICE. Furthermore, it saves time for you and your men; yet it takes no more electric energy—current—to operate the "Long Stroke" Compressor than for the slow-going pumps in general use. The 6-inch stroke is responsible.

We have an interesting proposition for jobbers, distributors, with full territorial protection.



The MOTOR-COMPRESSOR Co.
Makers of Starting Devices and 2-Stage Compressors
52-60 DICKERSON ST. NEWARK, N. J.

MODEL K—Single-stage Compressor and ½-hp. motor, coupled together on base, complete, with valve air chuck, air gauge, 15 ft. electric cable, electric slip plug, switch and 25 ft. flexible metallic hose; 6-in. stroke; nickel steel crankshaft, hardened and ground, running on hardened roller bearings; hardened nickel steel gears running in oil in oil-tight case. This model also furnished in portable and stationary pump and tank outfits.

When Writing to Advertisers, Please Mention Motor Age

FACTS

—the greatest Battery Salesmen

Facts sell goods.

Sell them faster than arguments, faster than promises,
faster than personality, blarney or opinion.

Here are the facts that sell the



The Diamond Grid—Your customers know that Diamond Construction means strength. You don't have to argue—it's a fact.

The Quarter-Sawed Hard Wood Separator—Your customers can see for themselves the hard layers that mean perfect insulation alternating with the soft layers that mean perfect porosity. You don't have to promise—it's a fact.

The dozen or more other important engineering features—Your customers can understand their advantages.

You do not need "salesmanship"—they are facts.

What do these facts mean? A longer battery life for a better satisfied customer.

These facts are backed by an

18 Months Guarantee

Perhaps this explains the extraordinary success of Philadelphia Service Stations. Our increased factory capacity will take care of a few more dealers. Send for our proposition.

Philadelphia Storage Battery Co.

ONTARIO & C STREETS PHILADELPHIA, PA.

Sales Offices

Rochester, N. Y.,
30 Carlton Street.
New York, N. Y.,
1789 Broadway.
Cleveland, Ohio,
613 Citizens Building.

Columbus, Ohio,
318 First National
Bank Building.
Atlanta, Ga.,
128 W. Peachtree St.

St. Louis, Mo.,
2605 Locust Street.
Los Angeles, Cal.,
1105 West Pico Street.
Minneapolis, Minn.,
1122 Harmon Place.

Chicago, Ill.,
1621 S. Michigan Ave.
Pittsburgh, Pa.,
302 Park Building.
Huntington, W. Va.,
Hotel Huntington.

San Francisco, Cal.,
37 Spear Street.
Wilkes-Barre, Pa.,
20 Poplar Street,
Dorrancton.

Washington, D. C.,
2155 Champlain Ave.
Boston, Mass.,
90 Brookline Avenue.

When Writing to Advertisers, Please Mention Motor Age

LYCOMING FOUNDRY & MACHINE CO.
WILLIAMSPORT PENNA.

LYCOMING

MOTORS

The Motor is the Keystone of the Whole Car

Judge the car by the motor—What you want is reliable performance.

When you see a car equipped with a Lycoming Motor you can be

sure you have the car you have been looking for—that the rest of its equipment may be judged by the high quality of the motor.

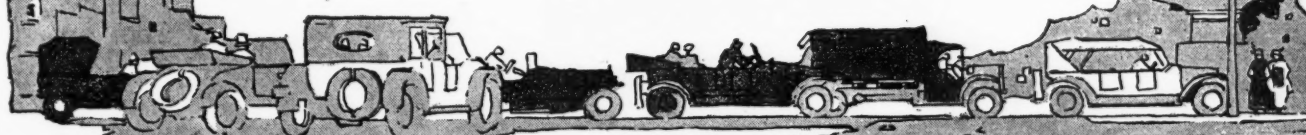
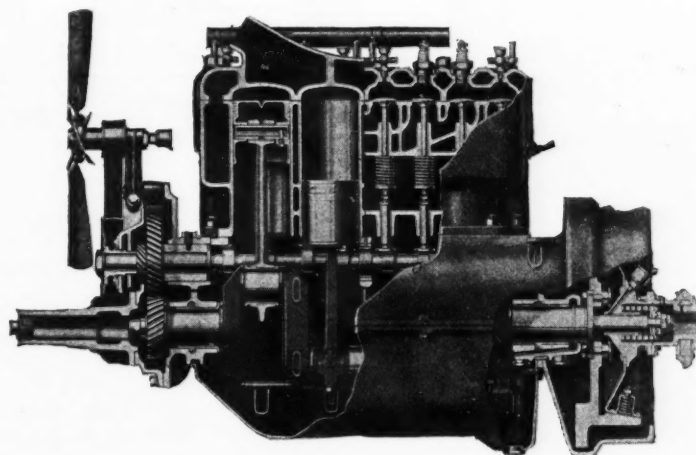
No fads, no frills, no ex-

travagant and sensational features which boost the price, but straight performance qualities giving you your money's worth in power, reliability and long service.

Model K, 4 cylinder, L-head, 3 point suspension. Bore 3 1/2", 5" stroke. S. A. E. h.p. 19.6, 30 B. H. P. at 1450 R. P. M.

Lycoming Foundry & Machine Co.

Williamsport, Pa.



THE MOTOR FOR THE DISCRIMINATING CAR BUILDER

When Writing to Advertisers Please Mention Motor Age

A Personal Experience with Threaded Rubber Insulation

I have one of the original lot of Still Better Willards, put out in 1916 before any announcement had been made to the general public.

It was in February, 1919, that I discovered my battery had Threaded Rubber Insulation. The car has seen plenty of hard service. I drove it all through the hard winter of 1918—extreme cold and lots of dark days.

But I never had any battery trouble of any kind till one morning in February when I found the battery dead. The day before, the distributor was out of order and a friend of mine who was driving, punished the starter severely and exhausted the battery.

I went to the nearest Willard Service Station, got a rental battery, and had mine recharged. I was told what I didn't know—

that I had Threaded Rubber Insulation in my Willard Battery.

I haven't had it recharged since, and it has the same old punch and pep today (June 1st). That's some record, I'll say.

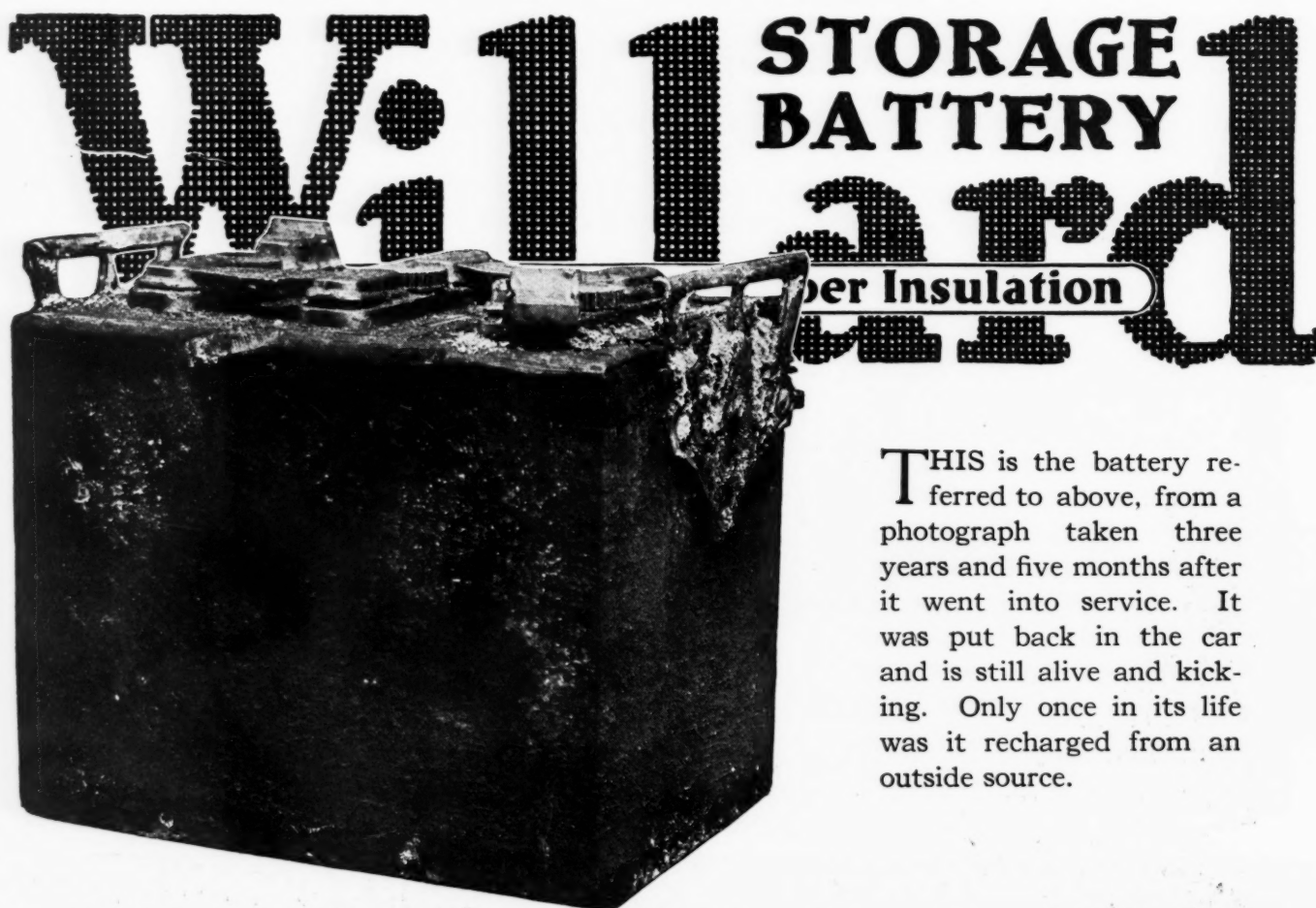
A. JUDSON,

13740 Euclid Ave., Cleveland, Ohio.

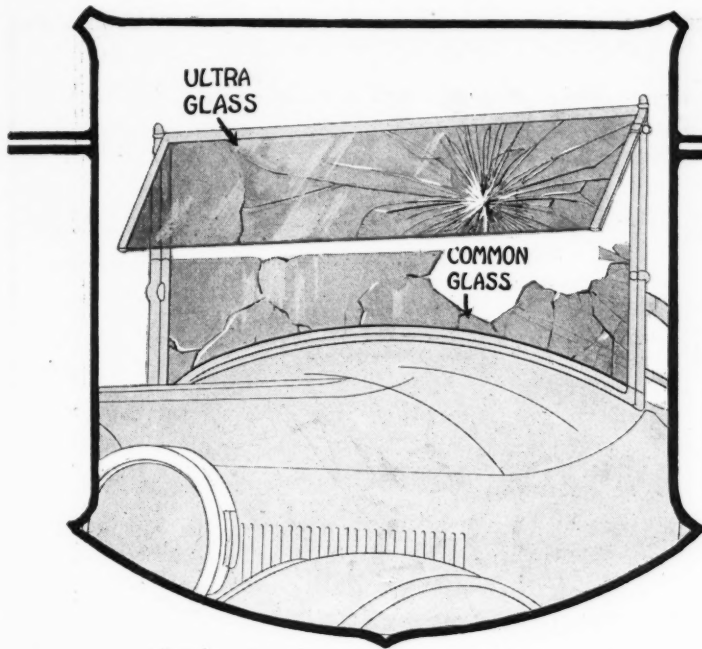
The above is a fair sample of what Threaded Rubber Insulation means. If this battery had had wood insulation, it would long since have had to be reinsulated; for the owner frankly admitted he had never been any too regular about keeping it filled with water.

Of course, starvation, overheating and improperly regulated electrical equipment will injure even a Willard Battery with Threaded Rubber Insulation, and therefore it's impossible to guarantee any definite length of life. But under equal conditions Threaded Rubber Insulation greatly extends a battery's life and indefinitely postpones reinsulation.

Three years' experience on thousands of cars has established this fact beyond any question.



THIS is the battery referred to above, from a photograph taken three years and five months after it went into service. It was put back in the car and is still alive and kicking. Only once in its life was it recharged from an outside source.



All Automobile Glass Serves Its Useful Purpose Until the Crash Comes—But Then—

In an instant flying glass cuts and lacerates. YOU know what happens. But it is no longer necessary to take common glass hazards. Ultra Glass here introduced solves the glass problem. It is the one sure, safe protection against broken, flying, scattering glass.

ULTRA GLASS

A beautiful, clear glass (containing no wire or other vision-confusing materials) is non-scatterable—it cannot be broken into pieces to fall, fly, separate or scatter. Violent hammer blows will not scatter it. At the most, only the fractured lines *show*—but it remains smooth as ever and in one piece.

Ultra Glass is a sure, safe protection against wind, rain and *accident*.

The photographed windshield sections shown here illustrate the effect of blow and shock on Ultra Glass and ordinary

plate—the story needs no further elaboration.

Ultra Glass represents the greatest glass improvement in years. It makes its appeal to owners who demand the utmost in car equipment. The sure, safe dependable protection afforded *only* by Ultra Glass urges its immediate adoption.

Naturally this extraordinary glass—Ultra Glass—is higher in cost of production—it costs more—it is also the last refinement in motor car equipment.

Made to the exact size to fit your present windshield or limousine frames. Ordered by template only, readily mounted.

A Dealer Proposition

GLASS FOUNDERS CORPORATION

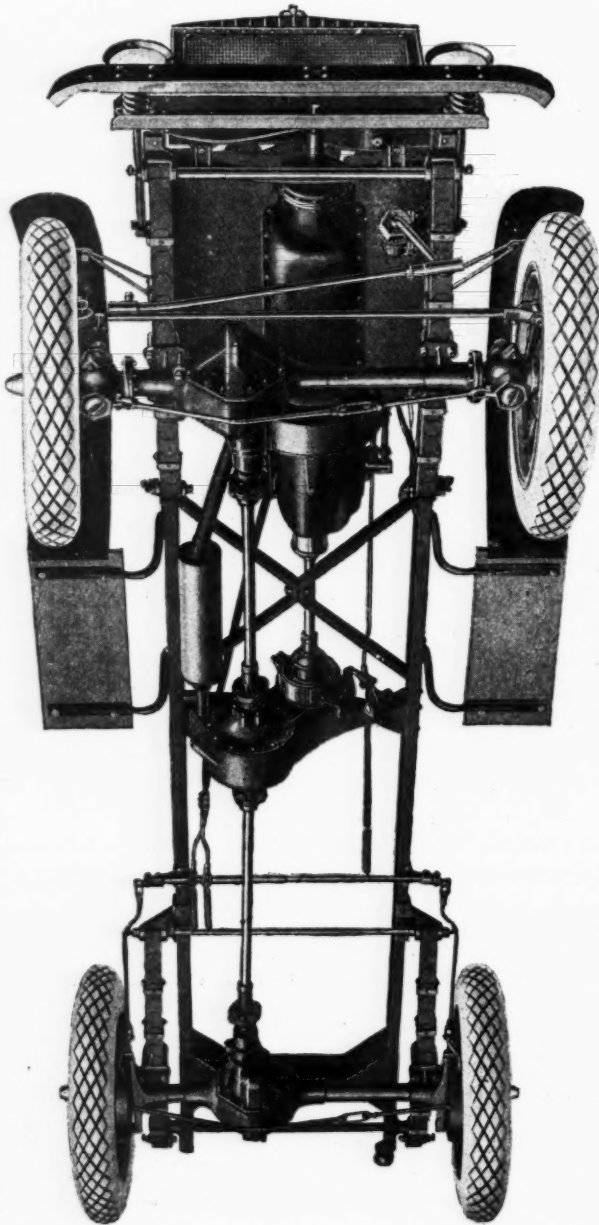
Milltown, New Jersey

U L T R A
A GLASS
G L A S S **THATS SAFE**

When Writing to Advertisers, Please Mention Motor Age

OSHKOSH 4-Wheel-Drive Trucks Give

—Twice the Traction—Nearly Twice the Ability On from 2-3 to 1-2 the Gasoline



The power is applied at four tractive points—the rear wheels do not waste power pushing the front wheels.

More power at all four wheels combined—enough at any pair to pull the truck out of mud, sand, loose gravel, snow and other rough going if the other pair are stuck.

And on steep grades—four gripping points of traction that do twice the work of two.

that's the Oshkosh 4-Wheel-Drive principle.

Much more of the power developed in the motor is delivered as usable working power.

To do the same work you use less gasoline—and on the same amount of gasoline you do more work.

OSHKOSH 4-WHEEL-DRIVE TRUCK

2 Ton Capacity

is the leader among 4-Wheel-Drive Trucks because of

Simplicity in Design

Study the construction in the illustration. Straight line drive from main transmission in unit with motor to main driving gears in sub-transmission in center of frame.

Oshkosh driving mechanism in front of steering wheels gives full power to the wheels even when they are cramped at extreme turning angle.

Front wheel and rear wheel propeller shaft of equal length transmitting power evenly to all four wheels.

Transmission service brake, rear wheel emergency brake.

This is the simplest 4-Wheel-Drive design—and the strongest.

DEALERS:—There is still a chance for you to get our dealership.

USERS:—There is need for an Oshkosh in your service now.

Send for Detailed Information

Oshkosh Motor Truck Mfg. Company, Oshkosh, Wisconsin

The JULY issue of
The TIRE RATE BOOK
 NOW READY
 for distribution

Is your order on file to secure a copy of this most
 valuable issue containing all new prices as of June 15th?

SEND US YOUR ORDER NOW

To delay entering your name on our subscription list
 may result in your order reaching us after our
 supply of this issue is exhausted. It contains:

Over 180 pneumatic tire price lists
(of which more than 130 are advertised)

Nineteen solid tire price lists
(of which 8 are advertised)

Ten rim price lists
(of which 9 are advertised)

476 PAGES

Each chock full of tire information

Act on that Impulse **NOW**

This subscription blank is for your convenience

**The
 Tire Rate Book**

239 West 39th St.
 New York City

Published by
 The Class Journal Co.

The Tire Rate Book,
 239 West 39th St., New York City

Please enter my order for — subscriptions of The Tire Rate
 copies

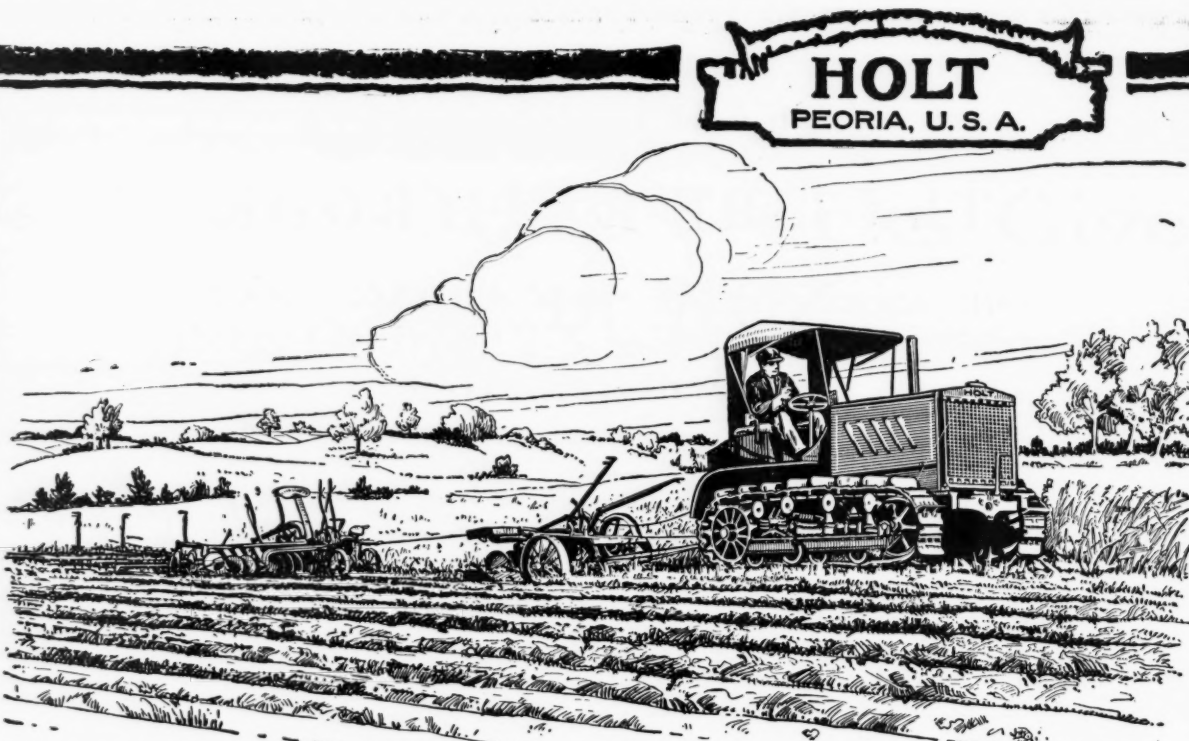
Book, for which I enclose \$.....

Subscription price \$1
 per year. 35c per
 copy. Subscriptions
 will begin with the
 July issue.

Name

Address

City



Do you **KNOW** this Tractor?

THE Holt "Caterpillar" is now available for agricultural and commercial purposes. In 1914 the "Caterpillar" was exclusively adopted by the British War Department for military purposes. In 1915 the "Caterpillar" (heavy type) was converted by the British War Department into the world-famous "Tanks." In 1916 the "Caterpillar" was exclusively adopted by the French War Department and also applied in prin-

ciple to the French "Tanks." In 1916 the "Caterpillar" was exclusively used by the U. S. Army on the expedition into Mexico. In 1917, after months of extensive tests and demonstrations, the "Caterpillar" was awarded exclusive military recognition by the U. S. Army for motorizing the Artillery forces, and later was applied in the manufacture of "Gun-Mounts," "Tanks," "Cargo Carriers and other equipment. No other type of traction could meet the exacting conditions demanded for war work.

"CATERPILLAR"

REG. U. S. PAT. OFF.

The more you know of the Holt "Caterpillar" and of its history during the past four years, the more you will feel sure that this Tractor is the one you have always wanted—the Tractor that you can absolutely depend upon to do your work when and as it should be done. You can now change from the known reliability of horses for your field work to the more economical, more reliable "Caterpillar," with full assurance that you will be the gainer in every way by the change. Whether or not you saw the "Caterpillar" at the

Wichita Demonstration, write us for the story of its work in peace and war. **KNOW** the "Caterpillar." The knowledge will be of service to you.

The important fact that we wish to drive home is the dependability of the "Caterpillar"—its flexibility and usefulness in a most diversified field. "The Caterpillar" dealer commands the very best trade in any territory. We will be glad to send you further agency particulars upon request.

not a 'type' but a Tractor—Holt builds it

The 5-ton "Caterpillar" (U. S. A. Ordnance type), illustrated above, will develop 3600 pounds drawbar pull under normal conditions; at least four 14-in. mould board plows is a conservative load where plowing conditions are at all fit. It carries and lays its own track; mud, soft soil and sand offer no obstacle whatever, as this

tractor was designed to negotiate shell holes and trenches of the war-torn fields of Europe.

It can turn in its own length—making close fence corner work quite possible. It is equipped with three speeds and reverse will travel on the road, if required, as fast as 8 miles per hour but on plowing work its direct speed at 900 R. P. M. is a bit less than three M. P. H. High speed plowing is what we are coming to, so keep this feature well in mind.



Following our extensive production for war purposes, we can now make immediate deliveries on all models

THE HOLT MANUFACTURING COMPANY, Inc. PEORIA, ILLINOIS

NEW YORK CITY OFFICES
50 Church Street

SOUTHWESTERN OFFICES
Wichita, Kansas

F. L. HALLORAN
Union Ave., Memphis, Tenn.

YANCEY BROS.
Distributors, Atlanta, Ga.

CATERPILLAR
Reg. U. S. Pat. Off.

When Writing to Advertisers, Please Mention Motor Age

GENERAL

Lightning Cut PISTON RINGS

in conjunction with an

Original Selling Plan

Not Just Another Piston Ring—

but a one piece piston ring embodying the many constructive improvements long predicted as absolutely essential to efficient engine performance. The hope of forward looking automotive experts is now an accomplished fact.

It is our privilege to introduce the GENERAL LIGHTNING CUT PISTON RING as the last word in piston ring improved design and construction.

Distortion during expansion has long caused most piston ring troubles. The General Lightning Cut Ring is of concentric design, constructed of fine gray iron, not pot but INDIVIDUALLY cast, with the scale remaining on the inside. It has a uniform tensile strength and an evenness of expansion that closely approaches the long sought solution to this problem of distortion during expansion.

With an evenness of expansion equalled perhaps

only in one or two other makes, there has been added a feature that leaves the Lightning Cut Ring supreme in the field of piston ring performance. That feature—that step in the progress of ring manufacture—lies in the kind of cut and oil groove used.

The Lightning Cut Ring obtains its name from the peculiarly cut slot—a cross between the old diagonal and the step-cut slots. This ring, with expansion troubles foreseen and met in its concentricity, its construction and its casting—has this cut of a new type for an old and long sought purpose. And it is this cut in combination with its evenness of expansion and its irregular oil groove, reduces the loss of compression to a minimum.

For while this oil groove affords ample means of lubrication—on the upstroke, it will, on the downstroke, scrape off the surplus oil without scoring the cylinders—a condition long sought and much needed.

Not to Be Marketed in the Usual Way

Details of our new sales plan are about completed. We have determined upon a sales policy that will introduce this Lightning Cut Piston Ring to the public through a distribution plan never before equalled in the automotive field. True from the standpoint both of fairness and of profit for the dealer.

In the meantime jobbers and dealers are cordially in-

vited to communicate with us in regard to establishing profitable relations.

This new LIGHTNING CUT PISTON RING will be furnished in all sizes, packed in oil-proof envelopes, placed in cardboard cartons of a rugged make, attractively labelled to help dress your shelves. A practical and attractive piston ring cabinet is furnished for display. Write today for details.

General Lightning Cut Piston Rings are thoroughly tested and guaranteed

UTILITIES SALES CORPORATION

Sales Representatives

GENERAL UTILITY COMPANY

Factory 1324 Ogden St. Philadelphia - Office 809 New Stock Exchange Bldg., Philadelphia

Utilities that Sell Because They Serve



COMMERCE dealers everywhere are selling more Commerce trucks than are specified in their contracts.

Here is the reason. Units make the truck. Buyers know it. They are familiar with the reputation, performance and records of the nationally known standard units.

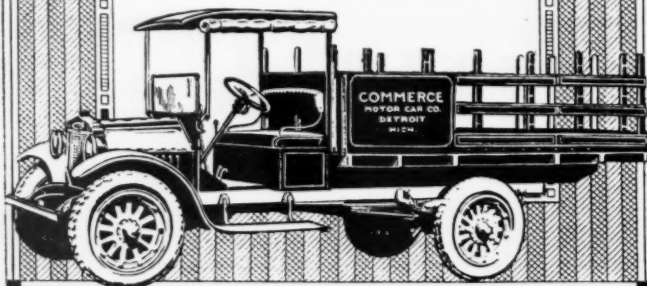
Finding all of the best and most favorably known units in Commerce specifications, and more of them than in any other truck made, is it any wonder buyers purchase Commerce trucks?

Here are the Units:

Continental Red Seal Motor
Torbenon Rear Axle with
Timken Bearings
Detroit Gear Co.'s Transmission
Highland Commercial Bodies
Detroit Steel Products
Springs
Eiseman Magneto & Impulse
Starter
Spicer Universal Joints
Willard Storage Battery
Zenith Carburetor
Stewart Vacuum System
Jacox Steering Gear
Bijur Electric Generator
Champion Spark Plugs
Cast Tank Truck Radiator

The Commerce Motor Car Co.

Manufacturers of Motor Trucks
Detroit, Michigan



DU PONT AMERICAN INDUSTRIES



Take the Tar Off Your Car

Pontoklene makes road tar run. On fenders, body or running gear, no matter how hard or old the tar, this wonderful new cleaner will remove it. It's great for cleaning engines and machinery too. There's a practical reason why.

PONTOKLENE

(A Du Pont Product)

is a natural solvent for grease and tar. It softens and dissolves both. No rubbing—no scrubbing. Just apply and wipe clean. Every private or public garage should have a supply of it.

Pontoklene is **not** a polish, except in that it actually cleans the surface—takes off the dirt. It is a cleaner—a solvent. We offer it simply as a "specific" for road tar and grease. Use it according to the directions printed plainly on each package and it will give efficient, satisfactory results without damage to the finish of your car.

SEND TODAY FOR A FREE SAMPLE

Give it a trial and let it surprise you. Or if you prefer we will send you a full size, quart can for \$1.00 postpaid.

Advertising Division

Du Pont Chemical Works

Owned and operated by

E. I. du Pont de Nemours & Co.
WILMINGTON, DELAWARE

The Principal Du Pont Products Are

Explosives: Industrial, Agricultural and Sporting. **Chemicals:** Pyroxylin Solutions, Ethers, Bronzing Liquids, Coal Tar Distillates, Acids, Alums, Etc. **Leather Substitutes:** Fabrikoid Upholstery, Raynite Top Material, Du Pont Rubber Cloth. **Pyroxylin Plastics:** Ivory, Shell and Transparent Py-ra-lin, Py-ra-lin Specialties, Challenge Cleanable Collars and Cuffs. **Paints and Varnishes:** For Industrial and Home Uses. **Pigments and Colors in Oil:** For Industrial Uses. **Lithopone:** For Industrial Uses. **Stains, Fillers, Lacquers and Enamels:** For Industrial and Home Uses. **Dyestuffs:** Coal Tar Dyestuffs and Intermediates.

For full information address

Advertising Division, E. I. du Pont de Nemours & Co.,
Wilmington, Delaware

Visit Du Pont Products Store when in Atlantic City

DU PONT

HALLADAY

A Shock Absorber That Builds New Business

This is the Shock Absorber that every Ford owner is looking for because it is the first and only Shock Absorber that has ever had the CAPACITY to take the Jolts and Jars out of the light little Ford.

When you sell a Halladay Direct Suspension Shock Absorber you make a new customer. For the Halladay DOES what others CLAIM.

The Ford owner who has purchased a Halladay from you will come back to you for all of his accessories. He will have confidence in you and your goods.

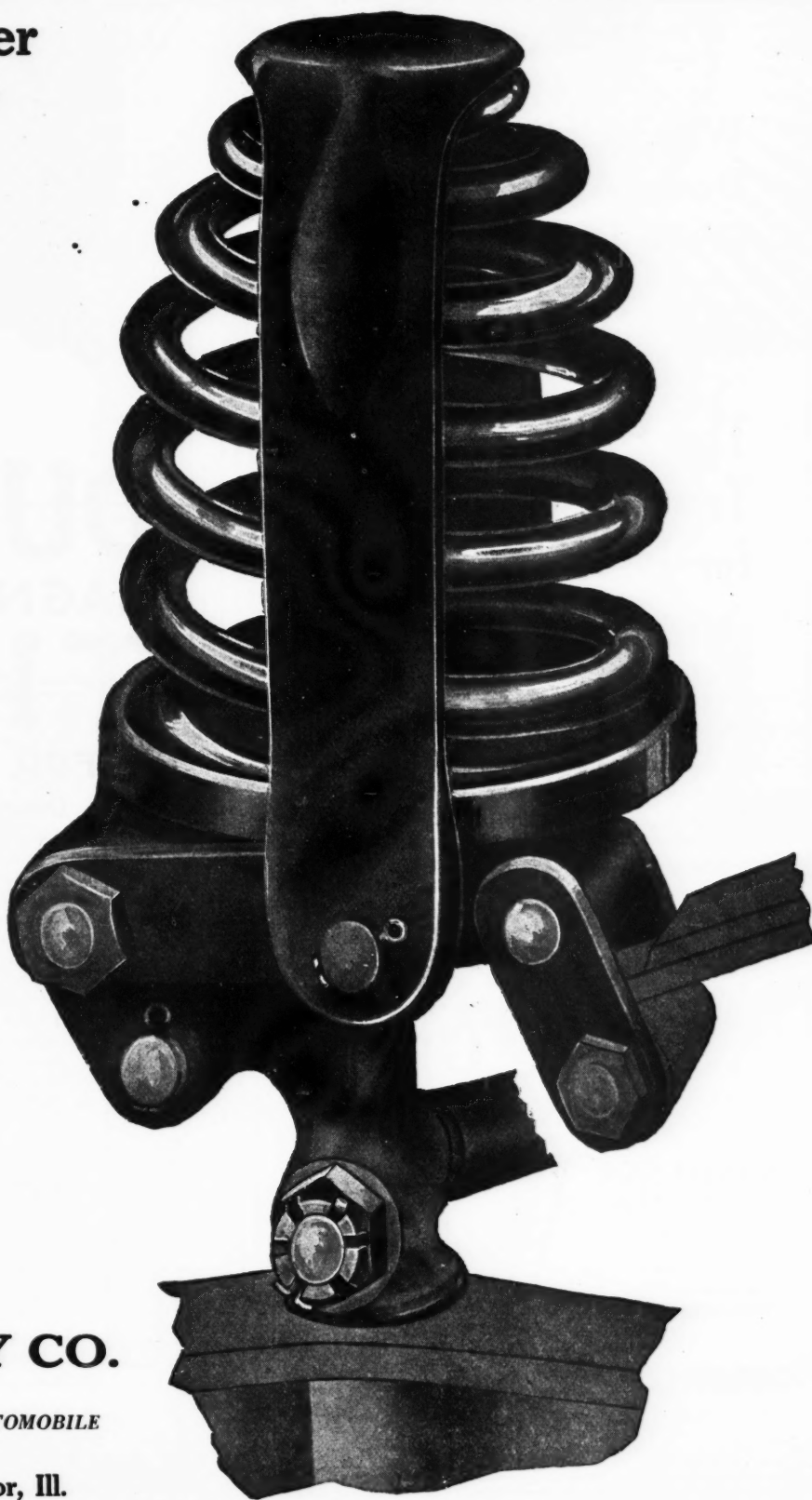
The Halladay Direct Suspension Shock Absorber is sold strictly on its merits and is backed by the guarantee of one of the oldest manufacturers of Shock Absorbers in the country. This is the season for big profits. Write now for full particulars.

Price per Set. . \$15.00

L. P. HALLADAY CO.

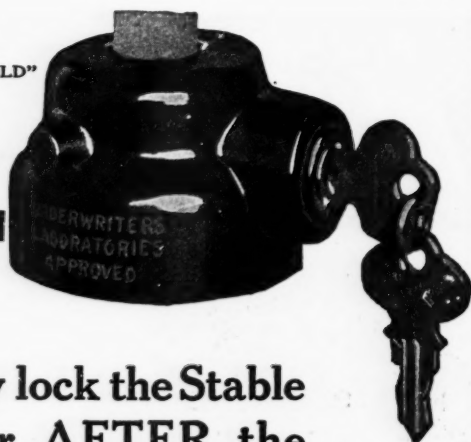
Manufacturers of
BUMPERS, SHOCK ABSORBERS AND AUTOMOBILE ACCESSORIES

520-530 Monroe Street, Streator, Ill.



When Writing to Advertisers, Please Mention Motor Age

"LOCKS
WHERE LOCKS HOLD"



Why lock the Stable Door AFTER the Horse Is Gone?

—and why regret you didn't protect your Buick after it has been stolen. The sensible, safe and sure way is to protect yourself against loss by thieves by installing

The POSITIVE Transmission Lock for BUICK Cars

Locks the gears in neutral at the only place on the Buick car where the gears can be controlled. Takes the place of the dust cap on the ball and socket lever. Locks with a single turn of the key. Safe enough to reduce your insurance rates. Every Buick car deserves this protection.

Write for complete details

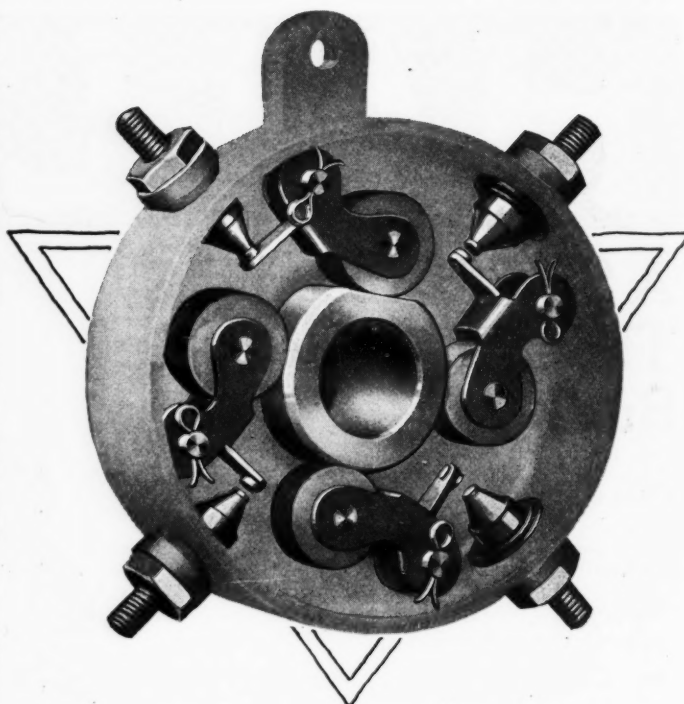
**NORTH SIDE
BUICK SALES
COMPANY**

918-926
Sheridan Road
CHICAGO, ILL.

**Price
\$7.50**



BUICK CENTER CONTROL LEVER
WITH POSITIVE TRANSMISSION LOCK



DUNTLEY MAGNETO BREAK TIMER

FOR ALL FORD CARS

Overcomes Every Timer Trouble

This timer is designed and built so it can't go wrong. Mechanically, it is as near perfection as an article of this kind can be made.

Its fiber rollers, in addition to their superior wearing qualities, eliminate the necessity for oil. They are a feature with which all timers should be equipped.

There are no sliding contacts to become insulated with oil; the positive contact overcomes starting troubles; the tungsten points will not pit or burn; positive timing on all cylinders; interchangeable on regular Ford fittings. Tests show remarkable savings in fuel.

FOR FORDSON TRACTORS

The following letter tells the experience of a Fordson Tractor owner, who uses a Duntley Magneto Break Timer.

"The timer you sent is all you claim for it. It certainly gives the tractor twice the power it had before and also is a saver of fuel." Name on request.

**SOLD ON AN ABSOLUTE
MONEY BACK GUARANTEE**

Dealers—Write for our sales proposition

JACK DUNTLEY

1004 Michigan Ave.

CHICAGO, U. S.



When quality and service are considered before initial cost, motor cars are equipped with

Genuine
Pantasote
Top Material

the most expensive yet the most durable of all top materials—the best money can buy.

Here's proof of the pudding in a nut shell.

PIERCE ARROW	WHITE
PAIGE LINWOOD	COLE
SCRIPPS BOOTH	REG SIX
MERCER	CADILLAC
COLUMBIA	PREMIER
LOCOMOBILE	HUDSON
CHALMERS	KISSEL

Look for Pantasote label inside the top—it protects you against substitution which is not uncommon.

The Pantasote Company
Bowling Green Building
New York



The Mark that **Guarantees** **Better** **Quicker** **Cleaner** **Valve Grinding**

S & P BRAND **Valve Grinding Compound**

increases speed, reduces time and makes a smoother, cleaner valve and seat surface than was ever thought possible. Has remarkable abrasive action. Does the job in less than half the time required by other compounds and costs less. Used by the largest New York Service Stations exclusively and this tells the story of its value.

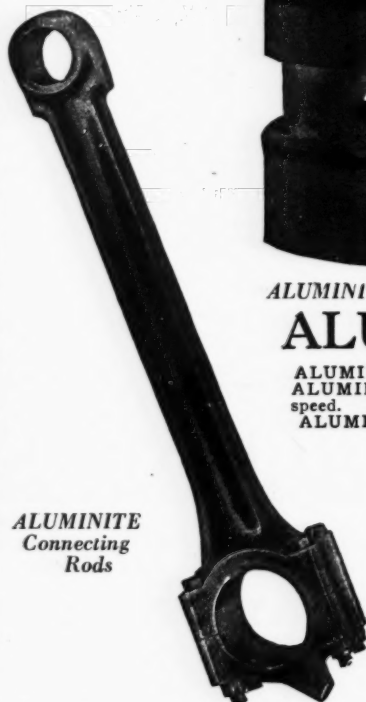
S & P BRAND **Valve Grinding Compound**

is entirely free from acids. Not adversely affected by climatic conditions. Furnished in 5 oz. Duplex cans at 40 cents per can. Also supplied in 1 lb. cans for factory use. Ask your jobber and insist on S & P Brand Valve Grinding Compound.

FREE TRIAL CAN!

Every repairman—dealer—garageman and service station man should at once send for free sample. Use it on your next job. Actual demonstration will prove what S & P Brand Valve Grinding Compound can do for you.

S & P Manufacturing Co.
163 Columbus Avenue New York



ALUMINITE
Connecting
Rods



ALUMINITE PISTONS

ALUMINITE PISTONS

ALUMINITE Pistons are *more* than aluminum pistons. Strong enough to withstand all strains. Hard enough to give good bearing surfaces. Light enough to insure valuable fuel saving.

At overhauling time have ALUMINITE Pistons installed by your repairman. Cost you less in the long run.

DEALERS and REPAIRMEN profit by the ALUMINITE line.

ALUMINITE CONNECTING RODS

ALUMINITE Connecting Rods increase the efficiency of ALUMINITE Pistons. Give the motor greater power and speed. Decrease vibration and gasoline consumption. ALUMINITE Equipment is most efficient when complete.

GREEN POWER PLUS Cylinder Heads

Price \$25

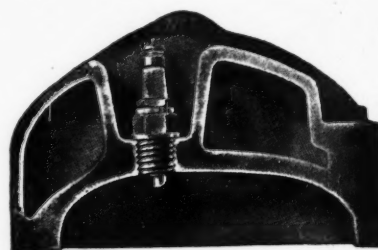
Sold on 30-Day Trial

Gives additional water space around the spark plug, gained by locating the plug directly over the center line of your cylinder. The result is additional power and pull for **1000** PASSENGER CARS and TRUCKS.

WRITE

GREEN ENGINEERING CO.

34 South St. Clair Street, Dayton, Ohio



Green Power Plus Cylinder Head

Guaranteed 10,000 Miles

At last—a fan belt of known and guaranteed performance. DEALERS—This is the safe belt to stock.

FLEX-O-TYTE FAN BELT

Combines Flexibility With Tightness.

Made for all cars. Built of special Rubber Coated Fabric, vulcanized into a one-piece belt—wrapped cure process.

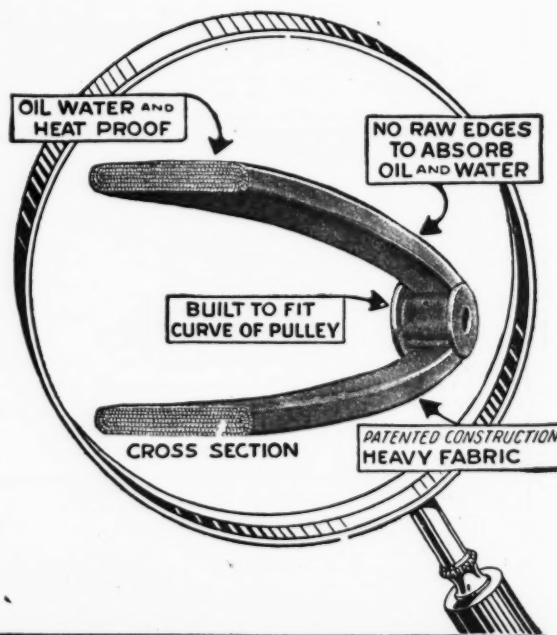
Dealers—Order Sample

The name of your supply house and 10c to cover postage and packing brings sample belt promptly. Our 32 page catalog **FREE** on request.

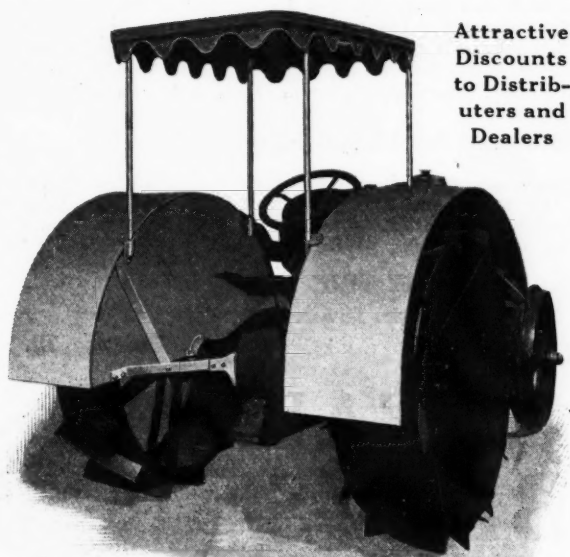
A. J. STEPHENS RUBBER CO.

1401 CHESTNUT STS.

KANSAS CITY, MO.



WEISTEEL Fender and Canopy Equipment for Fordsons



Attractive
Discounts
to Distrib-
uters and
Dealers

A WONDERFUL PROFIT MAKER

\$27.50 Complete
F.O.B. Atchison Kan.

\$22.75 Without Canopy

Note—Three sets of equipment in each crate.
Packing charge of \$1.50 for broken crates.

The Weisteel Equipment—
is heavier and more substantially built, from fender to the smallest
rivet, than any other like equipment on the market—

And Yet—
the Weisteel requires no boring of holes to attach and requires only
thirty minutes from packing crate to the furrow, and—

You Can Sell—
more Weisteels because of these features,—because of the big, ever
increasing demand for this sort of equipment, because of Weisteel
superiority, its fine appearance, its rugged construction, its ease of
installation and—

BECAUSE THE PRICE IS RIGHT, \$27.50

DEALERS: Order from your Fordson distributor now.
If he can't supply you, write us and tell us his name.
Immediate Deliveries

Henry Weis Mfg. Co., Atchison, Kans.

DEALERS— SELL ENGINE PROTECTION



WATER

GAUGE

\$3

Motalarm is a watchful day and night signal giving unfailing automatic warn-
ing of low water in the radiator.

The principle is simple. The tube shown in the illustration projects to within
1 inch of the bottom of the water chamber. When the water falls below the
one inch level the steam operates a siren.

The note is powerful and continuous. It is a warning which, if heeded, will
prevent burnt bearings, cracked cylinders, backfire and much loss of time and
money.

The lower part of Motalarm, coated with a specially prepared paint, acts as a
water gauge, showing through adhesion of the water to the tube just how
much is in the tank.

MOTALARM

is not affected by radiator cap heat nor by outside weather conditions. It is
simply a steam whistle, and nothing but water tank steam or air in the tank
or piping can operate it.

DEALERS—Every car, truck and tractor in your territory needs Motalarm.
It costs the buyer but \$3.00—it may save him hundreds. It is that little ounce
of prevention that is worth the pound of cure. We make your profits worth
while. Stock up now.

JOBBERs—Our proposition to you is interesting. Send for it.

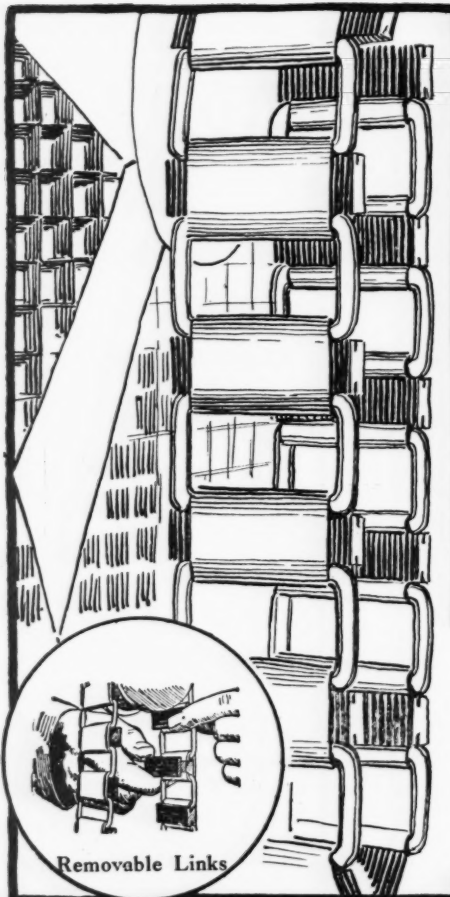
MOTALARM CORPORATION

Licenses Nolan Patent

Executive Offices, 1777 Broadway, New York

YOU DON'T HAVE TO WATCH IT

When Writing to Advertisers, Please Mention Motor Age



Car owners—truck owners and tractor owners are coming more and more to recognize the importance of the fan belt. When they come to your store show them the Mechanical Fan Belt. Tell them all about it. When they see how its scientific construction insures

100% Fan Efficiency

they will install it. Point out its unique, simple and logical design—its strong and durable construction, and how easily the sole leather blocks that prevent slipping can be removed or inserted. These finest quality leather blocks are held by fingers of steel that run in a chain made of special steel. Mechanical Fan Belts are not affected by water, heat or oil. Can be easily, quickly fitted without changing fan belt pulley, regardless of length of old belt. Each belt is

Guaranteed for 15,000 Miles

If it fails to meet this unusual guarantee, it will be repaired or renewed FREE. Proportionate guarantee for trucks and tractors. *Dealers*—order from your jobber. If he can't supply you, write direct. *Jobbers*—This belt supplies a long wanted need. Sales are rapidly increasing. Wire or write today.

PREMIER ELECTRIC CO.

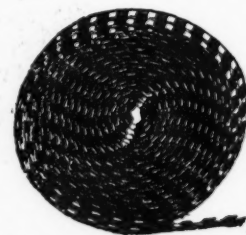
Motor Accessories Division

3805 Ravenswood Ave.,

Chicago, Ill.

MECHANICAL FAN BELTS

For Automobile, Trucks and Tractors

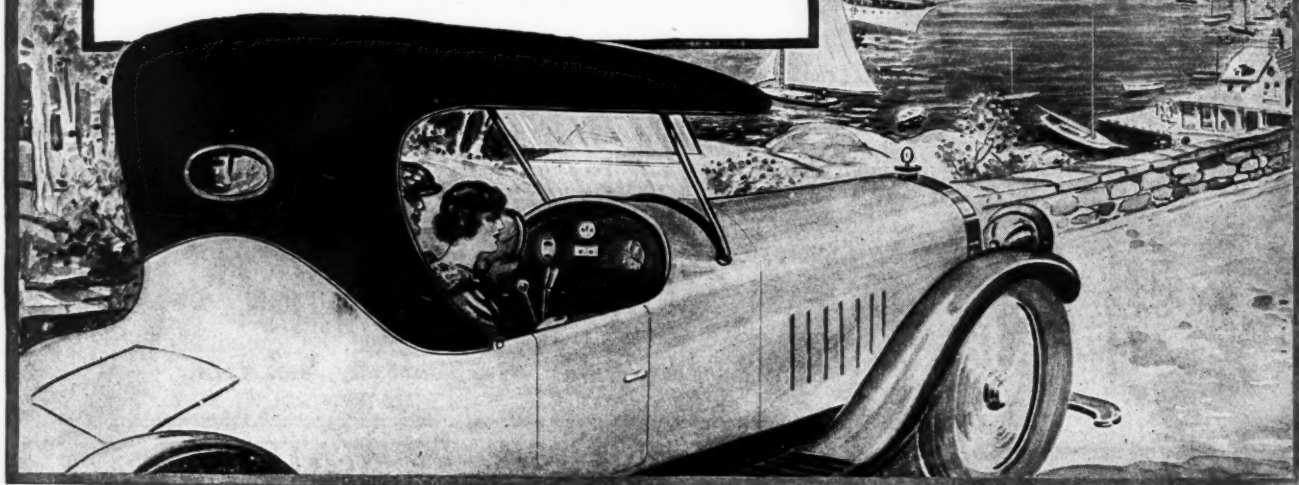
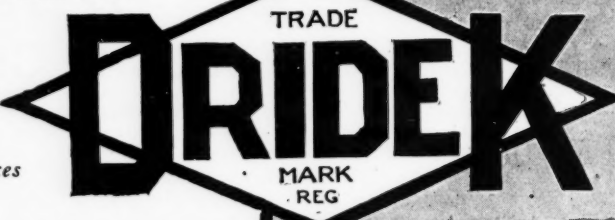


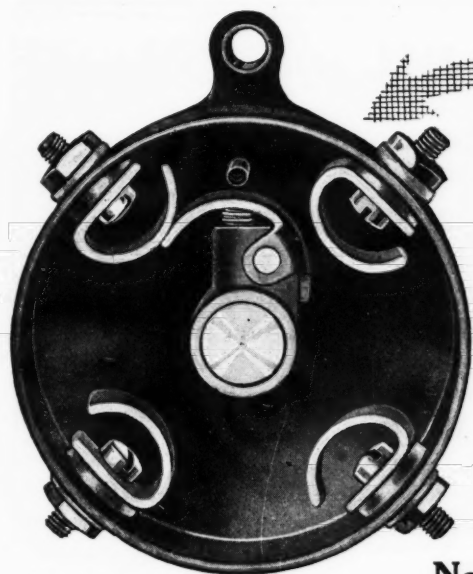
The Most Remarkable Automobile Top Material

LIGHT IN WEIGHT — DEPENDABLE IN
QUALITY — NON CRACKING — NON
BLISTERING—Dridek is Made to Satisfy.

Send to Dept. C for Samples and Prices

L. J. MUTTY COMPANY
BOSTON, MASS.





The Wiping Contact Insures Perfect Operation

Two results—both mighty important in timer operation—are obtained by the wiping contact in the Sure-Shot Timer, viz: positive action and exactly the right length of contact to insure a long, hot, fat spark. Every particle of gas is exploded by this super-energetic spark which means greatly increased motor efficiency.

Think this over and decide if this isn't the kind of timer your Ford customers want.

SURE-SHOT TIMER for FORDS

No Roller or Pin to Wear—No Fibre to Gum Contact

Absolutely Self-Cleaning

The stationary contact brushes are made of 85% carbon tool steel, hardened and polished to reduce wear to a minimum. They are aligned, when assembled, with a go and no-go gauge which positively assures contact with the rotating brush at all times. Each timer is tested to stand 5,000 volts.

High carbon steel in all working parts assures long life and durability.

The Sure-Shot Timer is self-cleaning and requires no lubrication. For two years it has been tested under actual road conditions. Fittings are all standard.

Because the Sure-Shot is designed to operate with ease and absence of friction and because it is made of the very best materials it will last as long as the Ford car itself. That's why it is a popular seller.

LIST PRICE

\$2.00

Liberal Trade Discount

Dealers

You will find our proposition attractive. The Sure-Shot sells readily, its popularity grows steadily in any community. Wire or write for complete details.

Write for details of our sales plan.

AERO MANUFACTURING COMPANY

7 South Clinton Street

Chicago, U. S. A.



Bowser Curb Gasoline Pumps and Lubricating Oil Outfits make a profitable combination. The Bowser reputation for accuracy and, quick clean service gives you a standing in the community that means more business and profits.

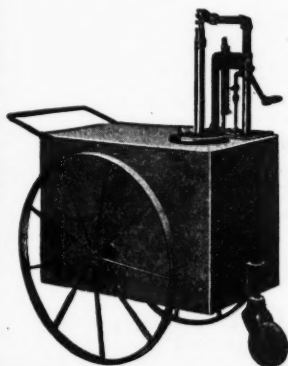
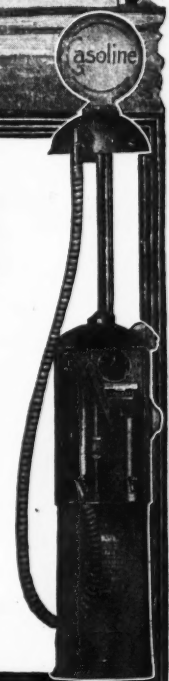


Figure 154 Lubricating Oil Outfit takes the oil to the machines, in the garage or at the curb. It is easily moved about and may be left standing wherever desirable. It's a real oil salesman, time and labor saver. Ask for Bulletin Figure 154.

Figure 241 "Red Sentry" Pump measures the gasoline directly into automobiles—Filters and Meters every drop pumped. A Speedy, Attractive and Accurate Distributor of gasoline. Ask for Bulletin Figure 241.



LONDON
32 Victoria St., S. W. 1
HAVANA
Lonja del Comercio 427

S. F. BOWSER & CO., Inc.
FORT WAYNE, INDIANA, U. S. A.
Canadian Office and Factory, TORONTO, ONT.

PARIS
5 Rue Denis-Poisson
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6 Castlereagh St.

The New 1½ Ton VICTOR TRUCK

OFFERS A SPLENDID OPPORTUNITY FOR RESPONSIBLE DEALERS

The price, \$1950, is far below the cost of trucks of a similar capacity that contain the same quality parts. The dealer's discount of 20% gives you a real incentive for results.

Some of the excellent features of this new Victor Truck are: Continental motor, Eisemann magneto, Zenith carburetor, Fuller transmission, Clark internal gear drive, M & S working differential, Tuthill half elliptic springs, Ross steering gear, gravity fuel feed, positive force feed lubrication. Wheelbase of 144 inches and channel steel frame.

Get an option on the right territory today

Write us at once

VICTOR TRUCK CO., INC.

St. Joseph, Mich.

Also manufacturers of
Victor Truck Builders

THE DUPONT MOTOR MFG. CORPORATION has been organized under the laws of the State of Delaware with general offices at Wilmington, Delaware.

The Corporation will manufacture DUPONT MOTOR CARS.

Announcement of the Policy of the Corporation will be published from time to time.

This Corporation is not affiliated with the E. I. du Pont De Nemours Company or with the General Motors Co.

WIRE WHEELS HOUK

We can supply immediately, sets of Houk Wire Wheels for all the cars listed and any of the service stations below will gladly install them.

Dealers should send at once for the particulars of our service and sales agency proposition.

Buick	Franklin	Oldsmobile
Cadillac	Haynes	Overland
Chalmers	Hudson	Paige
Chandler	Hupp	Scripps-Booth
Chevrolet	Kissel	Studebaker
Cole	Lexington	Stutz
Dodge	Marmon	Velie
Dort	Maxwell	Westcott
Essex	Nash	Winton



HOUSE

Set of 5 House Wire Wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, one hub dust cover for spare wheel. White, Black, Red; color optional. For Fords, \$65.
For Chevrolet 490 and Overland Model 4, \$75.

WIRE WHEEL CORPORATION OF AMERICA

(Successors to Houk Manufacturing Co.)

1700 Elmwood Ave. Buffalo, N. Y.

Direct Factory Branches and Service Stations:

New York, 835 11th Ave. at 57th St.	Detroit, 16 Davenport St.
Philadelphia, 328 N. Broad St.	Los Angeles, 1216 S. Grand Ave.
Chicago, 23rd St. and Indiana Ave.	San Francisco, 1690 Pine St.

Exclusive Canadian Representatives:
Dunlop Tire & Rubber Goods Co., Toronto



Practical Handbook of Gas, Oil and Steam Engines

By JOHN B. RATHBUN

A PRACTICAL treatise on gas, gasoline, oil and steam engines. Oil burners for use in steam engines are also included. Special emphasis is placed on farm tractors and their operation, both oil and steam driven. The engines described are the latest types, and include the Diesel, Semi-Diesel, Gnome, Low and Turbine types.

CONTENTS

Heat and Power.—Fuels—Calorific Values of Fuels—Solid, Liquid and Gaseous Fuels—Kerosene—Gasoline—Crude Oil—Producer Gas—Illuminating Gas—Coal—Benzol. Working Cycles.—Definitions of Cycles—Indicator Diagrams—Practical use of the Indicator—Typical Four Stroke Cycle Engines—Single Cylinder—Four Cylinder Automobile—Opposed Type V Type—Tandem—Twin Tandem—Rotary—Cylinder—Radial—Diesel—Knight—Argyle—Rotary Valve—Typical Two Stroke Cycle Engines.—Two Port—Three Port—Marine—Controlled Port—Aeronautic—Oechelhauser—Gnome Rotary Two Stroke. Oil Engines.—Elyria—Marine Diesel—Installation—Aspiration Types—Fairbanks—Morse—Kerosene—Carburetion—Semi-Diesel—Combustion of Heavy Oils. Ignition Systems.—Hot Tube System—Low Tension System—High Tension System—Details of Make and Break Batteries—Low Tension Magnetos—High Tension Magnetos—Coils—Adjustment—Troubles. Carburetors.—Principles of Carburetion—Jet Carburetors—Water Jacketing—Fuel Supply—Different Types of Auto Carburetors—Adjustment—Carburetor Troubles. Lubrication.—Forced Speed—Splash System—Oil Pumps—Lubrication Troubles. Cooling Systems.—Evaporation Systems—Radiators—Air Cooling. Speed Governors.—Automobiles—Stationary—Adjustment—Mixture—Control Hit and Miss—Mixed Systems. Tractors and Various Farm Engines.—Gasoline and Oil Tractors—Mechanism of Various Types—Steam Tractors—Plowing and Threshing Costs—Plowing Contests Data—Two Speed Mechanisms—Draw Bar Pole—Oil Carburetors, etc. Oil Burners.—Combustion—High Pressure System—Low Pressure System—Mixed System—Burners for Furnaces, Locomotives, Pennsylvania Type, Steady Burner, Kirchhoff Burner, etc.

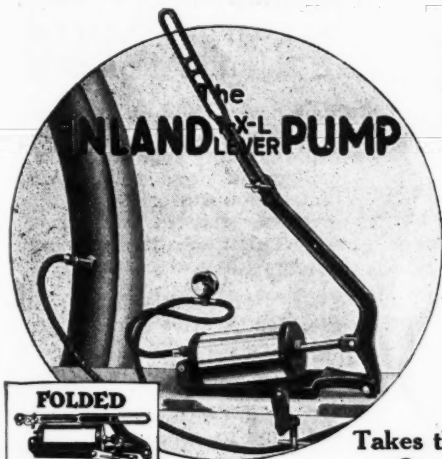
Flexible Leather \$1.50 Silk Cloth \$1.25
370 Pages, 150 Illustrations

U. P. C. Book Company, Inc.

Successor to Motor Age Book Dept.

243-249 West 39th Street, NEW YORK

The Famous INLAND TIRE PUMP



Has
Eighteen
Times
the
Power

Takes the Backhump
Out of the Job

Clamps on running board in an instant; inflates average tire in two minutes with use of one arm. Short stroke gives enormous leverage. Most powerful light weight pump made.

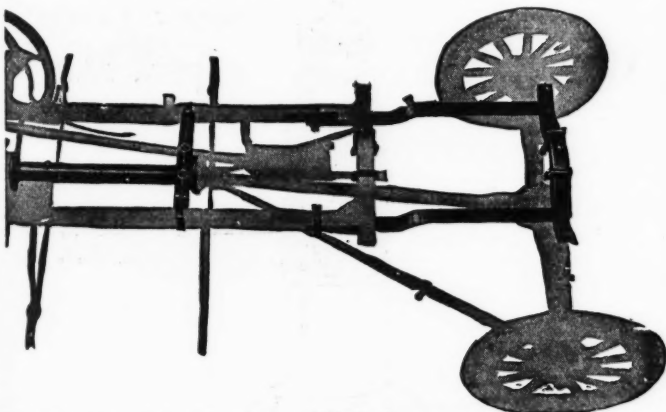
Dealers—Over 100,000 in Use

Car owners buy readily. It is just what they need. Will last for years. Mechanically perfect. No parts to lose. No seam in cylinder to wear plunger. Weighs only 8 pounds. Folds up snugly. Inflates to 90 pounds easily.

Our Advertising to the Car Owner

Our ads now running in a number of leading periodicals. They will help every dealer who handles the Inland Tire Pump in pleasing and holding his trade. An excellent proposition for you. Retails at \$8.00 or \$7.00 with pressure gauge. Write us today for particulars.

INLAND PUMP MFG. CO.
Dept. K, Reaper Block, CHICAGO



Every dealer has customers for this

All the Material in the Hay-Dee Extension is of the highest quality obtainable

Hay-Dee Extension for FORDS

Makes a practical delivery car chassis out of a standard Ford without drilling a hole. The Hay-Dee Extension solved the ambulance problem for the Government.

**MORE THAN 5,000 IN USE
BY SATISFIED CUSTOMERS**

15-In. \$55 Making a
115-inch wheelbase

30-In. \$60 Making a
130-inch wheelbase

HAYES-DIEFENDERFER CO., Inc.
1876 Broadway New York

**NEW
LOWERED
PRICES
NOW IN EFFECT**

Write Today
for
Information

Battery Charging makes
the Biggest, Safest Profits
in Your Garage if You
Use the

**HB 32-Battery
Charger**

For **BIGGEST PROFITS AT LEAST EXPENSE**, use HB Charging Equipment. Actual letters from HB Users in our files show that they make \$100 to \$450 clear profit each month. It costs them from 12c to 15c to charge batteries, and the owner pays from 75c to \$1.50.

The Biggest Money-Maker in Your Garage

Recharges 1 to 32 six-volt batteries or their equivalent at one time. HB Automatic Voltage Control enables you to recharge batteries of different voltage at the same time. Tapering charge puts run-down batteries in perfect condition. Easily installed and operated, requiring no electrical knowledge to handle. First cost your only cost. No burn-outs, expensive renewals, or delicate parts. Simple, sturdy, absolutely dependable, ready for use 24 hours every day.

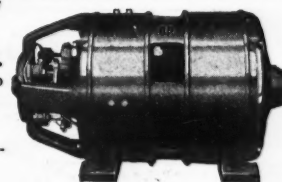
Small Payment Puts This Money-Maker in Your Garage on Absolute Money-Back Guarantee.

Balance on easy monthly payments. Start your battery business on a profit making basis NOW. Mail this ad with your letterhead today for full information. You run absolutely no risk. We take all the risk.

HOBART BROS. CO.
Box A73 Troy, Ohio

Successful Manufacturers
Since 1893

Write for information on HB Ball-Bearing Motors and Generators.



*May we send you this guide of
Buffalo and Niagara Falls?*

AN illustrated guide to points of interest in and around Buffalo and Niagara Falls. Free on request.

When in Buffalo, stop at the Hotel Lenox—Buffalo's ideal hotel for motorists. Quietly situated, yet convenient to theater, shopping and business districts and Niagara Falls Boulevard. First-class garage.

European plan. Fire-proof, modern. Unusual cuisine. Every room an outside room.

\$2.00 up.

On Empire Tours, Road map and running directions free.

C. A. MINER,
Managing Director,
North St. at Delaware Av.
Buffalo, N. Y.



HOTEL LENOX

Send Us Your SCORED CYLINDERS

and cracked water jackets. Our factory nearest you will make these repairs on a 24-hour service basis.

Regrinding of cylinders that have been scored by wrist pins or through other causes is unnecessary. The Lawrence Patent Process fuses a silver-nickel alloy into the defects making a quick, clean, permanent job without altering the bore of the cylinder. Same piston and rings fit.

Cracked water jackets are also made permanently good through this same process.

A list of our factories is given below. There is one near you. Send the scored cylinders and cracked water jackets to the nearest plant. There we will insure you quick service and perfect results.

Aside from the liberal arrangements we make with you, the money saving service you render your customers will help make you known as a concern that looks after their interests—and this is a business asset in itself.

Write to any of our factories for full information.

L. LAWRENCE & CO.
2026 Woolworth Bldg., New York

PLANTS

Buffalo, 10 Summer St.
Chicago, 1522 Michigan Ave.
Cleveland, 6259 Euclid Ave.
Detroit, 1246 Jefferson Ave.
Los Angeles, 335 Washington St.
Milwaukee, 18-26 Martin St.

Minneapolis, 14-16 N. 9th St.
Newark, N. J., 292 Halsey St.
N. Y. C., 791-3 Eleventh Ave.
Philadelphia, 1601 Summer St.
Pittsburgh, 5102 Baum Bldg.
San Francisco, 116 Hyde St.

LICENSEES

Denver, Blanchett Welding Co., 149 South Broadway.
Kansas City, Kans., General Auto Parts Co., Grand Ave.
Lima, O., Buckeye Repair Shop, 133 Water St.
Memphis, J. B. Cook Machine Shop, 294 Washington St.
Providence, R. I., Liberty Manufacturing Co., 15 Pine St.

Established 1862

A Few Territories Still Open for Licensees



WAR RECORD NOT MADE PUBLIC

The "Whitney" Special
Quality "Type M" Chains

Made a great showing during the war years 1916-1917 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars owned in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.
HARTFORD, CONNECTICUT



There's a Growing Demand For This Strong—Sturdy James Pump

You have found it good business policy to build your good will on quality accessories. You will find it good policy to sell James Pumps because this pump gives the day in and day out service that enhances your reputation with your customers.

There's one James feature—the patented positive check valve—that sets it above all other pumps in your stock. The valve is so simple that it can be re-ground and replaced in perfect condition by the owner.

Stock this James pump. Write for literature and discounts.

Generator Valve Company
Sole Manufacturers

47 Dinsmore Pl., Brooklyn, N. Y.

JAMES TIRE PUMP

THE WONDER

SELF-CLEANING Spark Plug

Intensifier
Better Ignition

Intensifying Gap
for tracing Ignition trouble.

Valvular Collar.
Shown open for
cleaning. Is closed
for normal
use of plug.

Cleaning ports
through which
Gasoline vapor
and compressed
air are ejected
while engine is
in motion; also
for priming.

DEALERS--JOBBER

With a popular, quick-selling article like this you can make some mighty handsome profits. Our proposition is unusually attractive. Write for full particulars.

**B. and C.
Organizing
Company**

KANSAS CITY, MO.

Electric Starting & Lighting Troubles Boiled Down

The author of this work spent weeks in the service stations of practically every important lighting and starting system manufacturer, for the sole purpose of getting facts on diagnosis and repair of electrical troubles. The book tells how to locate troubles and repair them.

Special attention is given to trouble testing by elimination, finding troubles by symptoms, and locating troubles by units.

Not a superfluous word is included. Exactly how to find and how to repair it—that is all you want to know and that is what is given.

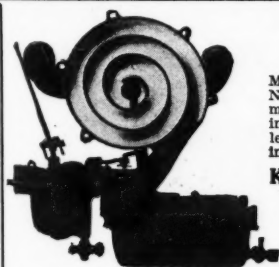
This boiled-down service pocket book will enable YOU to locate electrical troubles and repair them without having to wade through masses of irrelevant matter. It will save time, money and patience.

36 PAGES

26 FIGURES

Heavy cardboard 50 cents
Flexible leather 75 cents

U. P. C. Book Company, Inc.
243-249 West 39th Street New York



Perfect Combustion SAVES GASOLINE!

Motor troubles in the Ford can now be minimized. No dirty spark plugs; no carbonized motors; no more scored cylinder walls and burned out bearings caused by unvaporized fuel. More power, less gasoline and PERFECT COMBUSTION by installing the—

Kellogg Vaporizer and Separator

A wonderful new device that is in reality a super carburetor. Takes low grade gasoline—thoroughly vaporizes the part that will burn and separates the non-combustible elements. The unvaporized liquid drops into residue tank and is drawn off and discarded. Only pure, thoroughly mixed gas gets into motor. Use it on any Ford motor. GUARAN-

TEED 20% MILEAGE INCREASE AND A CLEAN MOTOR.

Endorsed by "HOLT" CATERPILLAR CO.

The reproduction of the letter to the right speaks for itself. But one of the many like testimonials of "Kellogg" efficiency.

THE HOLT MANUFACTURING COMPANY

TRACTORS
COMBINED HARVESTERS, PLOWS, ETC.
PEORIA ILLINOIS MAY 27, 1919
A. H. HOLT, President

**Live Dealers
and Agents
CAN GET
TERRITORY**

There is still some available territory open to large distributors on the sale of the Kellogg Vaporizer and Separator. Agents and dealers can secure sales proposition from distributors in assigned territories or from the main office in open territory.

Write today

Your territory may still be open. Write us today. Enclose \$18.00 for Complete Attachment—or ask for further details.

The SWARTZ-SHELLEY CO., Peoria, Ill.

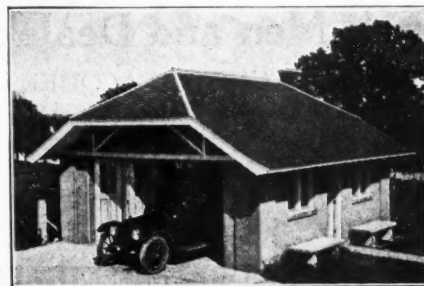
AND:W

Yours very truly

THE HOLT MANUFACTURING COMPANY

BY

RESEARCH ENGINEER



This Garage Is Distinctive

—because the doors are equipped with
RICHARDS-WILCOX

Slidetite

GARAGE DOOR HARDWARE

Slidetite equipped doors are easy to operate—occupy little space when open—will not sag—close tight, keeping out the severe weather and requiring less fuel to heat the garage. "SLIDETITE" Hardware for industrial as well as private garage doors.

Write for Illustrated Book

"Distinctive Garage Door Hardware"

Richards-Wilcox Manufacturing Co.

SAN FRANCISCO
LOS ANGELES
NEW YORK
CHICAGO

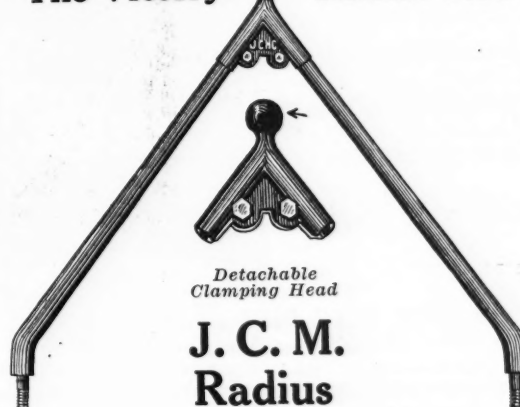
AURORA, ILLINOIS, U.S.A.

Richards-Wilcox Canadian Co., Ltd., London, Ont.

"A hanger for any door that slides"

PHILADELPHIA
MINNEAPOLIS
BOSTON
ST. LOUIS

"The Victory Radius Rod"



Detachable
Clamping Head

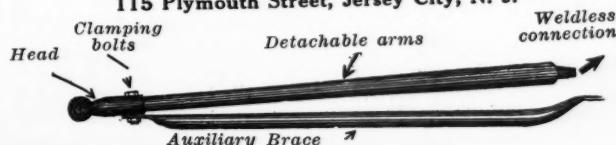
**J. C. M.
Radius**

Rods for Fords

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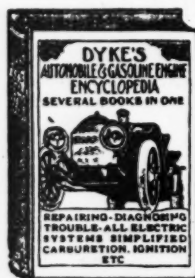
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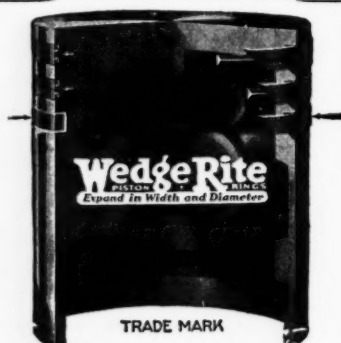
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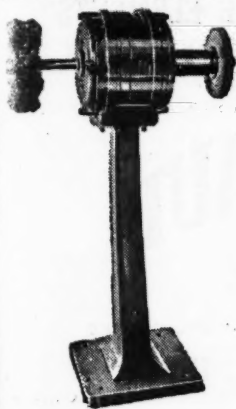


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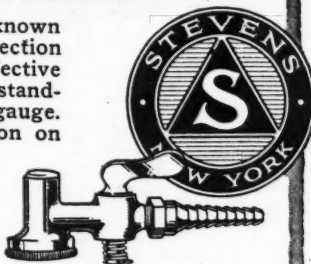
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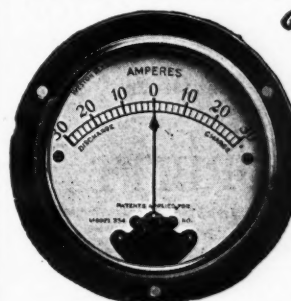
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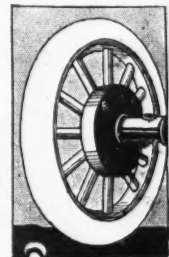
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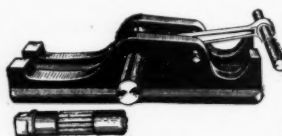
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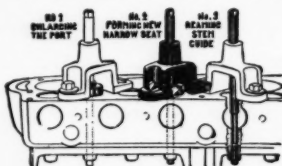
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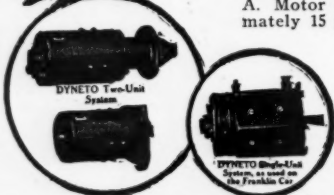
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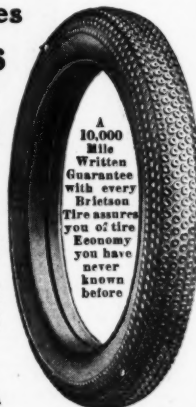
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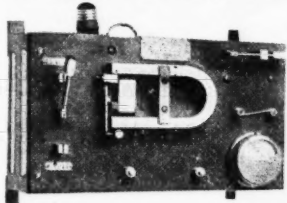


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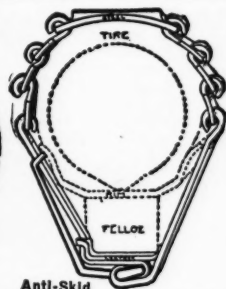
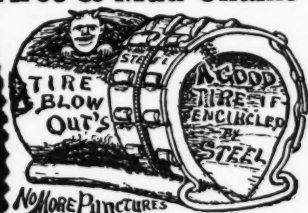
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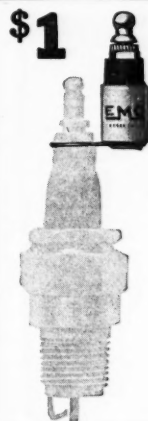
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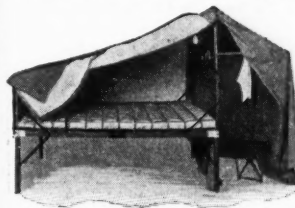
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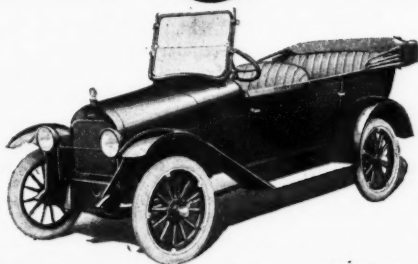
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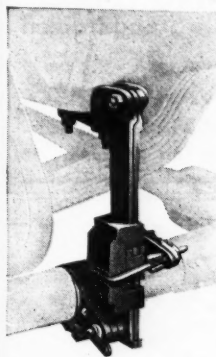
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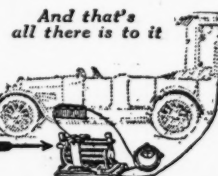
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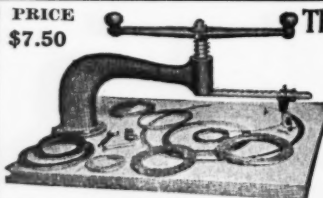
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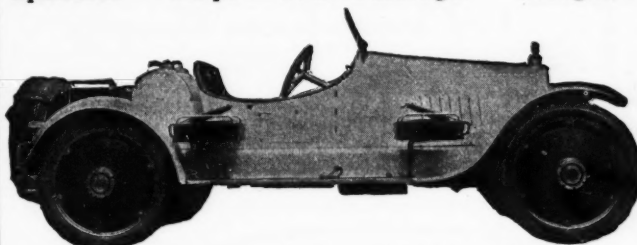
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Hill 3-A Spark Plugs cannot short circuit, leak compression, foul, or break. The design specifically provides against these evils. DEALERS—They will GO ON and STAY on the meanest motor that ever pumped oil. Order a set and prove it. Price \$1.25. Liberal discounts.

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30 cents each.



ATLAS ABRASIVE TOOL

you can do the job yourself by hand in your own shop without machinery of any kind. One hour completes the entire shaft and it's accurate to the thousandth. It is not even necessary to remove the shaft from crank case. If you believe in better profits and quicker service to your customers send along your order today.

ATLAS MANUFACTURING COMPANY
North Canal Street, Pittsburgh, Pa.

KINGSTON CARBURETORS

Starter Steel Ring Gears

For Fly-Wheels of All Cars

These steel bands, or ring gears, are to replace the cast iron teeth of the original fly-wheel. Send in your old fly-wheel and we will exchange or will put a band on yours. Or they can be put on in any machine shop that has a turning lathe.

Write for prices

KENT AUTO PARTS COMPANY
1743 Logan Street DENVER, COLO.



Waukesha 4-CYLINDER MOTORS For Trucks and Tractors

Sizes 3 3/4 x 5 1/4 to 4 3/4 x 6 3/4

Write for Literature

WAUKESHA MOTOR CO.
WAUKESHA, WIS.

EISEMANN

MAGNETOS

POWERFUL—DEPENDABLE—DURABLE

The Eisemann Magneto Co., No. 32—33d St., Brooklyn, New York



Inner armor
for automobile
tires pre-
vents pun-
ctures and
blow-outs.

INSYDE TYRES

Double mileage of any tire, old or new, easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details free. Distributors and agents wanted. Sales guaranteed.

AMERICAN ACCESSORIES CO., 250 Gulow St., Cincinnati, Ohio

USL storage batteries

machine-pasted plates



Southern Reground Bearings

Run Longer—Send Us Your Old Bearings

Distributors of S. K. F., S. R. B. and Gurney Bearings
SPECIAL QUOTATIONS TO DEALERS, GARAGE
AND REPAIRMEN

SOUTHERN BEARING COMPANY

39 Luckie Street, ATLANTA, GA.

YOU CAN RE-COVER IT YOURSELF

and SAVE 2/3
Price of a New
Top.



\$6.64 and up
Parcels Post Paid

Ask for
Catalogue No. 59
Ask for samples
of material.

New roof, and quarters sewed together. New Rear Curtain, Tacks, binding and fasteners. All ready to apply. We furnish printed instructions with each top. Give us name of your car, year and model number and we will quote you exact prices.
LIBERTY TOP & TIRE CO. Dept. W-7 Cincinnati, Ohio

Old Sol Road Lights

See our Advertisement next week illustrating Special Features of our Full Line of Road Lamps for 1919

Write for Catalog

The HAWTHORNE COMPANY BRIDGEPORT, CONN.

Strom BEARINGS

U. S. BALL BEARING MFG. CO.

(Conrad Patent Licensee)

Palmer Street and Kolmar Ave.

Chicago, Ill.

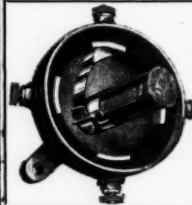


Pedal Extension for Fords

CAN be attached to pedal in a moment. Can't work loose. Built to withstand hardest service. Dealers! It sells itself. Thousands in use—demand increasing.

Write us today for proposition and particulars.
ELLIS SMITH MFG. COMPANY, Inc., Elmira, N.Y.

PRICE
75c



Miller Never Miss Timer

Good for 20,000 Miles
Sliding Contact Principle

It banishes Ford timer troubles and lasts five times longer than the ordinary roller brush outfit. Good for 20,000 miles. Easy seller—good profit. Write for trade proposition.

Mil-Mac Manufacturing Co.
1714 N. Broad St., Philadelphia, Pa.



Cut Hauling Costs

and speed up deliveries with Watson Trailers. They are producers.

WATSON PRODUCTS CORPORATION

Canastota New York

WATSON Trailers

Ford Service Station Equipment

Manufactured by the
Service Station Equipment Co.
of Chicago



Backed up by "The Fairbanks Co. O. K."
Branch Houses in 22 Leading Cities
Administrative Offices NEW YORK CITY

Rims
Axles
Springs

Stan-Par

Tubing
Rods, etc.
Bearings

Replacement Springs
THE STANDARD PARTS COMPANY, CLEVELAND, OHIO

BROWN - LIPE

TRANSMISSIONS
BROWN - LIPE - CHAPIN
DIFFERENTIALS

Factories & General Offices Syracuse N.Y.



GILLETTE

TIRES & TUBES

Products of the improved Gillette Chilled Rubber Process. Refining treatment that toughens rubber as iron is toughened by conversion into steel. Not affected by climatic conditions. Greatest mileage economy ever attained.

GILLETTE RUBBER COMPANY

General Sales Office:
1834 Broadway New York City, N. Y.
Factory: Eau Claire, Wis.

MICHELIN TIRES

HIGHEST QUALITY—MODERATE PRICE

Dealers are invited to write for
Michelin's attractive proposition.

MICHELIN TIRE CO., Milltown, N. J.

19 Wholesale Branches Assure Prompt Service

**Next Week Tractor
Demonstration Number**

THE CLEARING HOUSE

OF THE MOTOR INDUSTRY

FOR PARTS, ACCESSORIES, TIRES, MACHINERY, REBUILDING, REPAIRING, WELDING AND USED CARS. ALSO HELP AND SITUATIONS WANTED AND MISCELLANEOUS CLASSIFIED ADVERTISING.

READ OUR GUARANTEE!

YOU TAKE NO CHANCES WHEN BUYING USED PARTS FROM US

OUR GUARANTEE

You must be satisfied. Any article purchased from us which does not in your opinion give satisfaction or fit can be returned to us at our expense, and your money will be refunded at once.

NOTICE

An Open Letter to Purchasers of Automobile Parts

We quote prices and FURNISH parts for 87% of the inquiries we receive. It is impossible for any concern to furnish every part inquired for, but you are reasonably sure of getting what you want from us and when you want it. And you are absolutely sure of getting your money back if the part is not right in every way.

*"The
World's Largest Used Parts Concern"*

Every used part we sell carries our unqualified guarantee. Nothing could be fairer or more liberal. We know the quality of the parts we sell—we use such extraordinary care in selecting and examining each part that we do not hesitate to guarantee our goods. Our immense stock—the largest in the world—makes it possible for us to fill nine orders out of ten that we receive. Think that over—it's important when you figure that when you need a part you want it as quick as you can get it.

Our prices are 30% to 90% lower than manufacturers' list prices. When you can get **guaranteed** used parts at prices like this you are getting a proposition that can't be beat.

And keep in mind we can furnish parts for practically any make or model car.

A Partial List of the Cars for which we can furnish Parts

Abbott-Detroit	Cole	Great Smith	Locomobile	Overland	Seldon
American	Crow-Elkhart	Great Western	Lozier	Packard	Speedwell
Apperson	Dorris	Havers	Marmon	Paige	Stafford
Atlas	Elmore	Haynes	Marquette	Palmer-Singer	Stearns
Atterbury	E-M-F 30	Heff-Brooks	Matheson	Parry	Stevens-Duryea
Auburn	Everett	Henderson	Maxwell	Peerless	Stoddard-Dayton
Bergdoll	F.A.L.	Hudson	Michigan	Pierce-Arrow	Studebaker
Brush	Firestone	Hupmobile	Moline	Pope Hartford	Stutz
Buick	Flanders	International	Moon	Pope Toledo	Thomas-Detroit
Cadillac	Ford	Interstate	National	Premier	Velle
Carter Car	Franklin	Jackson	Nyberg	Rambler	Vim
Case	Garford	King	Oakland	R. C. H.	Warren
Chadwick	Gleason	Kissel	Ohio	Regal	Wayne
Chalmers	Glide	Knox	Oldsmobile	Reo	Wescott
Chase	Great Eagle	Krit		Schacht	Winton
Cino	Great Northern	Little			

Write to our Nearest Branch for Prices

Just let us know what parts you need and even if you don't care to place your order we will gladly quote you prices. Write today.

AUTO SALVAGE COMPANY, INC.

KANSAS CITY, MISSOURI
1701-03 Main Street

HOME OFFICE
ST. LOUIS, MISSOURI
2823-25 Locust Street

CINCINNATI, OHIO
314 East Third Street

"The World's Largest Used Parts Concern"

When Writing to Advertisers, Please Mention Motor Age

IF IT'S AUTO PARTS YOU WANT We Have 'em at Bargain Prices

Every Used Part Is in First Class Condition, and Will Render Satisfactory Service. If We Cannot Satisfy You, Your Money Will Be Cheerfully Refunded.

SPECIAL MOTOR BARGAINS

All in Excellent Condition UNIT POWER PLANTS

New Keystone, 6 cyl.	200.00
4 cyl. Chalmers 30	75.00
4 cyl. Herreshoff	75.00
Continental Type C	125.00
Continental Type E	125.00
Cole 6	125.00
Haynes 13-14	100.00
Maxwell 16-17	100.00
Herschell Spillman, 6 cyl.	125.00
New Sun 6 cyl. with Starter and Generator	225.00
1916 Abbott	200.00
Continental Type C, with starter and generator	175.00
6 cyl. Northway (Olds), with starter and generator	200.00
Imperial, with starter and generator	150.00
Hudson, 6-54, complete with starter and generator	200.00

MOTORS—ONLY

New Caille 8 cyl., with starter, generator & carb.	250.00
New Sun 6 cyl. with Starter and Generator	150.00
1914 Cadillac, with starter and generator	125.00
1914 Mitchell, 4 cyl.	75.00
1914 Mitchell, 6 cyl.	100.00
1913 Velie, 4 cyl.	75.00
Alco, 4 cyl.	75.00
2 cyl. Beaver (Clark Truck)	40.00
1910 Winton Six	75.00
6 cyl. Peerless, 1913	175.00
Minerva Knight Motor with Bosch Mag. and Trans.	175.00
National, 6 cyl. block	100.00
1916 Studebaker 6, complete	100.00
Atlas	80.00
Packard 18	100.00
Overland 83	90.00
Cadillac Marine Motor	100.00
Buda	100.00
Cadillac 15-4	100.00
Cadillac 13-4	90.00
Chalmers B 26	125.00
Studebaker 15-4	100.00
Studebaker 15-6	100.00
Buick 10	60.00
Case 12	90.00
Buick Block	70.00
Premier 13 and 14	125.00
83B Overland	100.00
4 cyl. Carter Car	75.00
1912 Peerless, 4 cyl.	150.00
Pierce Arrow 6-36	125.00
Pierce Arrow 6-48	150.00
Continental R, 4 cyl.	45.00
4 cyl. Metz	45.00
Little Giant, 4 cyl.	60.00
1915 Auburn, 6 cyl.	150.00
Liberal allowance made on your old motor	
Cylinder Blocks, Pistons, Shafts, etc., for most all motors	

MAGNETOS

Overhauled and Guaranteed	
DU4 Bosch Set Spark	\$25.00
DU4 Bosch Variable Spark	27.50
DU6 Bosch	30.00
New DU6 Bosch	35.00
DR4 Bosch	20.00
DR4 Bosch 2 spark	65.00
DR6 Bosch	25.00

SPECIAL NOTICE

To Car Wreckers!

We Buy Bosch Magnets, Hair and Leather, in Any Quantity

DR6 Bosch 2 spark	75.00
D4 Bosch	15.00
D6 Bosch	17.50
D6 Bosch 2 spark	45.00
New Sims H. T.	22.50
NU4 Bosch	15.00
ZR6 Bosch	55.00
ZR4 Bosch 2 spark	100.00
Eisemann Dual	15.00
Remy Model RL & D	7.00
Dixie Mags.	12.00
New Dixie Mags. 4 cyl.	18.00
Sims H. T.	12.00
Mea	12.00

COILS

Bosch Type A	\$7.50
Bosch Duplex	4.00
Eisemann	4.00
Splitdorf	4.00
Silent Starter and Generator Chains; all lengths and sizes.	

MOTOR GENERATORS

Remy 5, 6, 3	\$35.00
Disco 16 E-12 volt	35.00
Apple, Mod 25 A	25.00
Intz Chalmers	35.00
Northeast	20.00

SPECIAL BARGAINS

In New Partt and Material

New Autolite Ammeters, 20 amp.	\$ 1.50
New Autolite Ammeters, 30 amp.	2.00
New One-Man Top Wind-shields	8.00
Connecticut 3-button switches.	1.75
National Standard Medium Jacks	1.50
Heavy Grease Guns	.60
50 New Adjustable T Bump-ers, Nickel or Black, fit all cars except Fords, each	4.50

NEW LAMPS

11 inch single bulb	\$6.00
10 inch single bulb	5.00
Electric tail-lights	.85
Electric side lights, pair	1.75

NEW BRAKE LINING

Price per foot	
1½-in., 20c	1½-in., 25c
1½-in., 30c	2-in., 30c

FLEXIBLE TUBING

Price per foot	
1½-in., 25c	1½-in., 30c
1½-in., 35c	2-in., 40c
2½-in., 45c	2½-in., 50c

NEW GEARS FOR ALL CARS

New Bailey Differentials for Overland Models, 80, 81, 83. \$10.00

Prest-O-Lite Tanks

Model B	\$4.00 each; E	\$3.00 each
Searchlight Tanks	\$2.00	

NEW WIRE WHEELS FOR FORDS

Set of 4 wheels and 5 rims, \$45.00. \$5.00 allowance for old wheels. Demountable Rims for your Ford Wheels 30x3½—Set of 5 with 4 filler bands \$6.50.

NEW TIRES

5000 Mile Guarantee

Size	Ribbed Tread	Non-Skid	Size	Ribbed Tread	Non-Skid
31x3½		\$12.50	34x4	\$21.00	\$22.50
32x3½	\$15.00	16.00	35x4½	21.00	22.50
31x4		20.00	34x4½	25.00	27.50
32x4		17.50	35x4½	27.50	30.00
33x4		20.00	35x5	30.00	32.50
		21.00	37x5	32.50	35.00

10% Deposit Required with each tire ordered
Balance C. O. D. subject to examination

30x3	\$1.75	34x4	\$3.00
30x3½	2.00	36x4	3.50
32x3½	2.25	35x4½	3.25
32x4	2.50	36x4½	3.50
33x4	3.00	37x4½	3.75

NEW RELINERS

GOOD USED TIRES & TUBES

OBTAINED FROM WRECKED CARS
WRITE FOR PRICES

MAIL ORDERS SHIPPED SAME DAY
HIGHEST PRICES PAID FOR WRECKED CARS

Apple—A28 for Mitchell	25.00
Wagner 13 Studebaker	25.00
Remy S J 2	35.00
Remy No. 535	35.00
Jesco	25.00
20 Delco	20.00
Gray & Davis 2 Unit	35.00
Westinghouse S W 1158 A	30.00
New Remy Model 1801 6 volt Starter and Generator	60.00

GENERATORS

Gray Davis G. G. I. C.	\$15.00
Ward Leonard AG T	10.00-12.00
Splitdorf	12.00
Vesta	12.00
Berdon	10.00
Delco Oakland	10.00
Bijur, Series 51-30-5	15.00
Ward Leonard for King	15.00
Rushmore No. 1	15.00
New Remy Generators (Round Type) with relay	18.00
Remy with distributor	20.00
Westinghouse with distributor 250-221	25.00
Leech-Netville, 12 volt	16.50
Northwestern	10.00
Autolite	10.00-15.00
New Westinghouse 209 R	20.00

STARTERS

Autolite No. 7049-2407-6145	\$15.00-\$20.00
Autolite for Abbott	15.00
Gray Davis Chalmers	20.00
Leech-Netville Haynes	20.00
Gray Davis, Lozier and others	30.00
Autolite, Overland 79, 81, 83	15.00-20.00
Bijur Apperson	25.00
Allis Chalmers	15.00
Remy 182	20.00
Packard	20.00
Deaco	20.00
Starter for Palmer Singer	20.00
Westinghouse 533-S W 103	25.00
Allis Chalmers	15.00
Wagner for King	20.00

SECOND-HAND CAR DEPT.

\$150.00 to \$550.00
50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

SPEEDOMETER HEADS

Stewart or Warner \$1.50 to \$4.00

RIMS

All Styles and Makes \$2.00 Up

NEW RIMS

Firestone 34 x 4 SS	\$3.50
Stanwell 32 x 3½-34 x 4 SS	4.00
Baker 32 x 3½-34 x 4 SS	4.00
Rim Lugs and Nuts for All Cars	.15
New Steering Posts	5.00
Front Axles	35.00 to 50.00
Rear Axles	15.00 to 40.00
Radiators	10.00 to 35.00
Transmissions	15.00 to 100.00
Carburetors	5.00 to 9.00
Bearings	50 to 3.50
Springs	1.00 to 3.50
Transmission Gears	1.00 to 5.00
Differential Gears	5.00 to 10.00
Axle Shafts	2.00 to 8.00
Gasoline Tanks	1.00 to 5.00
Lamps	50 to 5.00
Windshields	3.50 to 8.00
Spotlights	3.50
Extra Good Stewart Vacuum Tanks	6.00
Carter Tanks	2.50

DEPOSIT REQUIRED

WITH
ALL ORDERS

WARSHAWSKY & CO.

LARGEST CAR WRECKERS IN THE WORLD

1915 SOUTH STATE STREET PHONE CALUMET 7315 CHICAGO, U. S. A.

WE HAVE NO BRANCH STORES

Replace Broken or Worn Out Parts

from our
Bargain Lists!

YOU SAVE
TIME AND MONEY

Every Part Guaranteed or
Money Promptly Refunded

Auto Wrecking Company

THE ORIGINAL "WE TEAR 'EM UP AND SELL THE PIECES"

13th and Oak Streets

KANSAS CITY, MO.

MOTORS

Everett 30	\$30.00
Flanders 20	50.00
E. M. F. 30	40.00
Columbia	60.00
Studebaker 4-15	75.00
Studebaker 6-13	75.00
Overland 53	50.00
Overland 60	50.00
Overland 71	75.00
Mitchell 6-17	125.00
Chalmers 6, 1915	100.00
Stoddard Dayton 30	60.00
Stoddard Dayton 45	75.00
Stoddard Dayton Savoy	75.00
Interstate 1916	75.00
Kissel 40	75.00
Empire 25	75.00
Buick 17	75.00
Case 1914	75.00
Cadillac 1912	75.00
Packard 6-48 1912	250.00
Packard 6-48 1914	300.00

UNIT PLANTS

Jackson 40	\$75.00
Chalmers 17	75.00
Menominee Truck	75.00
Nash Truck Model 2017	175.00
Dodge 1916 Starter Generator	175.00
Paige 1916, Fairfield Starter Generator	175.00
Hudson 6-54 Starter Generator	175.00
Nyberg 6	100.00
Oakland 6-60	150.00
Vellie 6, 1917	200.00
Pathfinder 12-cyl. Starter Generator	400.00
Oakland 8-cyl. Starter Generator	300.00
Kissel 6 Starter Generator	250.00

PARTS FOR ALL CARS

We Save You 50 to 80% of the Original Cost

SATISFACTION OR YOUR MONEY BACK

New Spotlights, 5" lens with
mirror\$3.48

Prest-O-Lite Tanks

Model B.....\$4.00 ea.
Model E..... 3.00 ea.
Searchlite Tanks. 2.00 ea.

COILS

Bosch Type A.....\$6.50
Eisemann 3.50
Splittorf 3.50

STARTERS

Gray & Davis.....\$14.00
Auto Lite, Bendix Drive. 17.50
Jones Starter and Generator.... 20.00

GENERATORS

Gray & Davis.....\$14.00
Remy 12.00
Vesta 10.00
Silent Starter and Generator
Chains, all lengths and sizes.
Lighting and Starting Pat-
terns\$6.00 to \$15.00
Rims 1.50 to 3.50
Carburetors 3.50 to 7.50

5% Off for Cash in Full
with Order.

Deposit Required with
All Orders.

Get Our Prices on New
Tires.

MAGNETOS

New

Bosch ZR6.....\$40.00	Bosch DU4 Variable... 24.50	Bosch ZR6..... 35.00
Bosch ZR4..... 35.00	Bosch DU4 Set Spark...\$20.00	Bosch D4.....\$14.00
Bosch DU6..... 32.00	Bosch DU8..... 27.50	Bosch D6..... 13.00
Eisemann G4 27.50	Bosch DR4..... 18.50	Eisemann 12.00
	Bosch DR6..... 20.00	Remy 6.00
		Dixie 11.00

Magnetos Overh'd & Guaranteed

NEW GEARS FOR ALL CARS

REBUILT BATTERIES

Guaranteed for 6 Months
6 Volt Starting and Lighting
Batteries\$13.50
12 Volt Starting and Lighting
Batteries 18.50

MOTORS

In Excellent Condition

Continental, Model E.....\$75.00
E. M. F. 30..... 50.00
4 cyl. Studebaker 25..... 50.00
4 cyl. Everett 30..... 45.00
4 cyl. Davis 30..... 50.00
Overland 69..... 60.00
Overland 83 with starter and
generator\$100.00

UNIT POWER PLANTS

Continental, Model E.....\$115.00
Chalmers 30 65.00
Radiators\$10.00 and up
Speedometer Heads.....\$1.00 to \$3.00
Axle Shafts\$2.50 to \$7.50
Front Axles Springs
Rear Axles Transmission Gears
Transmissions Differential Gears
Roller Ball Bearings (All Makes).
\$1.00 to \$3.50. Pistons, Cylinder
Blocks, Crank and Camshafts, etc.

Full Cash Refunds, less
Express Charges, Allowed
on Returned Goods.
Prompt Attention to Your
Orders.

OUR SLIGHTLY USED Tires and Tubes

OBTAINED FROM WRECKED CARS

Mean Economy to You—A Trial
Will Convince You

Size	Tires	Tubes
30x3	\$4.50	\$1.35
30x3 1/2	5.50	1.45
31x3 1/2	5.75	1.50
32x3 1/2	6.00	1.50
34x3 1/2	6.50	1.60
31x4	7.00	1.65
32x4	7.75	1.60
33x4	8.50	1.70
34x4	8.50	1.70
35x4	9.00	1.75
36x4	10.00	1.75
37x4	12.50	1.75
34x4 1/2	9.00	1.75
35x4 1/2	9.25	1.80
36x4 1/2	9.50	1.85
37x4 1/2	11.00	1.90
38x4	10.25	2.00
39x5	10.25	2.00
37x5	10.75	2.20
40x4 Non-Skid	15.00	

Express Must Be Prepaid on Old Tires Sent to Us.

Special New Tires

32x4 Clincher.....\$10.00	35x4 1/2 Clincher..... 15.00
---------------------------	------------------------------

Double tread Tires

Selected from best used material obtainable.

Reliners, \$1.25 Extra

Two tires, one with good top and other with
good sidewalls are trimmed, cemented and
sewed firmly together by Campbell lock
stitch method, twelve to fourteen plies fabric
making puncture and blowout almost im-
possible.

Size	Complete tire	You furnish one tire	You furnish both
28x3	\$4.15	\$3.00	\$1.50
30x3	4.75	3.35	1.50
30x3 1/2	5.80	4.25	2.00
31x3 1/2	6.50	4.50	2.00
32x3 1/2	6.75	5.25	2.00
34x3 1/2	7.00	5.60	2.25
31x4	6.95	5.75	2.50
32x4	7.15	5.65	2.50
33x4	7.80	6.25	2.50
34x4	8.00	6.45	2.50
35x4	8.75	7.15	2.50
36x4	9.40	7.50	2.50
33x4 1/2	9.25	7.60	3.00
34x4 1/2	9.65	8.00	3.00
35x4 1/2	10.15	8.20	3.00

MOTOR SALVAGE CO. 1425 S. State St. CHICAGO, ILL.

When Writing to Advertisers, Please Mention Motor Age

Parts and Repairs

Parts and Repairs

Parts and Repairs

NEW PARTS FOR ALL CARS

ESTABLISHED 1901

PURITAN MACHINE COMPANY

BEHIND

PURITAN EQUIPMENT

18 YEARS IN BUSINESS

WE DO NOT WRECK CARS

SEND FOR OUR MONTHLY BULLETIN "WISE BUYS FOR WISE BUYERS"

ACCESSORIES
AXLE SHAFTS
BALL CUPS
BEARINGS
BRAKE LINING
CLUTCHES
CONES
CRANK CASES
CRANK SHAFTS
DIFFERENTIALS
FANS
FENDERS
FRONT AXLES
GEARS
GENERATORS
HUBS
MOTORS
PISTON RINGS
PISTONS

IGNITION MATERIAL
6 Volt Model G. G. Auto-
lite Generator\$15.00
6 Volt Model G. H. Auto-
lite Generator 15.00
Cuno Clear Lighters for
Maxwell and Dodge..... 1.95
6 Volt Ward Leonard start-
ing motors 15.00
6 Volt Lighting Generator
with attachments for
Fords 23.00
Bosch DU6 Magneto—New
Bosch DU4 Magneto—Re-
built 35.00
Dimmer Switches 1.00
2 Gang Lighting Switch
with dimmer75
6 Volt K-2 Atwater Kent
Unsparkers 10.50
6 Volt K-2 Atwater Kent
Coils 5.00
STARTING AND LIGHTING
BATTERIES—BRAND NEW—
GUARANTEED BY THE
MANUFACTURER FOR ONE
YEAR.
6 Volt 80 Amp.....\$25.00
6 Volt 110 Amp..... 30.00
12 Volt for DODGE and
MAXWELLS 36.00

FOR FORDS
Fletcher Carburetors complete
with Hot Air Stove and Tub-
ing. Price\$ 8.50
Speedster Bodies..... 60.00
Sport Bodies—complete with top
and wind shield.....120.00
18-in. Steering Wheels. Cor-
rugated grip 3.95
Crown fenders—Heavy type—
set 15.00
Speedster fenders—set 10.00
Master Vibrators 1.98
\$1.50 Timers 1.05
Standard tool boxes 22 inches
long 1.35
K.W. Coil points—pair..... .25
Roller bearings for front wheels
—set 7.50
Fan belts. All models..... .20
Pony wrench sets—complete.. 1.20
Pistons—standard and oversize
complete with rings and pins 1.50
Bumpers—Channel type..... 5.00
ELECTRIC LIGHT YOUR FORD
Complete lighting system. Includes
generator, complete storage battery,
electric side and tail lamps, switches,
wiring, etc. Everything complete in-
stallation. Regular price \$29. Our
price, \$17.50.

SPECIALS
Timken Worm Drive Truck
Axle, complete with hubs and
drums\$85.00
1-in. Model R Schebler Car-
buretors—Top Intake, brand
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SPRINGS FOR ALL CARS
Complete Steering Gears, left or
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18 inch Steering Wheel, with
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All makes for all cars—Let us quote
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Brand new Honeycomb Type for all
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Premier
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FOR MANY
MAKES OF CARS

Prompt Shipments. Money Refunded on Parts Not Used, If Returned Within Ten Days. Liberal Discounts to Jobbers, Dealers, Garage and Repairmen
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FOR ALL CARS

New Gears and Shafts for 200 Cars
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One-ton outfits for trailers or Form-a-trucks with 32x3½
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EXCELLENT 2ND HAND TIRES AND TUBES
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MOTORS ONLY

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Overland 58..... 60.00
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All Makes and Sizes
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All Parts for 2 Cyl. Gra-
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Front and Rear Axles,
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Complete Rear Ends.
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PARTS FOR ALMOST EVERY CAR, INCLUDING:

Buick 1917	Krit 1915	Cadillac
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40 New Ford Ring Gears, each.....	\$2.00
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St. Louis, Mo.

Save 35% to 80%

Here's a partial list of cars for which we have parts. If the name of your car is not listed send us the part and we will duplicate, as we are daily buying and wrecking cars. We absolutely guarantee to return parts at our expense that can not be duplicated.

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American	Chalmers	Everitt
Apperson	Chevrolet	Flanders
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Auto Car	Cole	Great Western
Avery	Columbia	Haynes
Brown	Continental	Henry
Brush	Cutting	Hereschoff
Buick	Davis	Hudson
Cadillac	De Tangle	Hupp
Carnation	E. M. F.	I. H. C.
Carter Car	Elmore	Inter-State

International	Marion, 4 and 6	Packard
Jackson	Marmen	Paige
Kelly	Matheson	Paige-Detroit
Kissel-Kar	Maxwell	Parry
Knox	Marathon	Parry-Knight
Krit	McFarlan	Patfinder, 4 and 6
Leader	Mitchell	Peerless
Lexington	Nyberg, 4 and 6	Pierce-Arrow
Little	National	Pilot
Locomobile	Oakland	Pope-Hartford
Lozier	Oldsmobile	Premier, 4 and 6
Lyons Knight	Overland	R-C-H

Rambler	Stoddard-Dayton
Randolph	Studebaker
Regal	Stutz
Regal Underslung	Thomas-Detroit
Reo	Thomas Six
Richmond	Waverly Electric
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619 NORTH ILLINOIS STREET

"A Million Parts"

INDIANAPOLIS, INDIANA

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35 to 80% Off

from manufacturers' price lists. The following is only a partial list of cars we have in stock:

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Buick	Hupmobile	Paige
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Chalmers	Locomobile	R. C. H.
Cole	Lozier	Regal
Cutting	Marion	Stoddard-Dayton
E. M. F.	Maxwell	Studebaker
Empire	Marmen	Warren-Detroit
Flanders	Mitchell	Westcott
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Amperes, flush type, new.....	\$1.75
Oil Signal and Dash Light, for Fords, new.....	2.75
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Coil Unit for Fords, new.....	1.50
Spark Plugs, for Fords, new.....	.50

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MOTORS—FIRST CLASS, SERVICE-ABLE BARGAINS

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R. C. H.	\$45	Mitchell 10	\$55
Warren-Detroit	\$70	Flanders 20	\$45
Hupmobile 20	\$45	Krit, unit power plant, 75	
Fal. complete with high		Unit Type	
tension magneto and		Continental, type C	
carburetor	\$125	Abbot-Detroit	\$125
Auburn '16, elec. start		Paige, with elec. start	
Bemy ignition	\$200	Loesch H. T. Mag.	\$150

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Auto-Lite	\$17.50	Simms & Bratton	\$20
Leece-Neveill	\$17.50	Berdion	\$12
Vesta	\$15	Apple	\$25
Simms-Hurt	\$25	Dolco	\$20
Gray & Davis Generator and Starter for Fords	\$35.00		

Starters:

Auto-Lite Overland 80	\$17.50
Leece-Neveill-Haynes	\$20.00
Westinghouse	\$25.00
Transmissions	\$15 to \$35
Magnetos, all makes	\$5 to \$15
Carburetors, all makes	\$5 to \$15
Coils	\$4 to \$7.50
Rims	\$1.50 and up
Wheels	\$2.50 to \$5
Lamps	.50c to \$5
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For 150 different makes of automobiles (750 models)

And furnish them when you want them.

See our full page advertisement in this journal the first of each month.

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Deal with headquarters and be assured of good reliable parts at a fair price.

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SAVE 25% TO 75% ON USED PARTS

We Have Large Stock of Brand New Maxwell and Overland Parts

Maxwell Rear Springs.....	\$6.00	Overland Axles—all models.....	3.75	Ford Front Springs.....	3.00	Studebaker Axle Shafts.....	4.50
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House of Nearly 3,000,000 Parts

Gears for Transmission and Differentials Our Specialty.

We also carry used parts for the convenience of our trade when new parts are not obtainable. Call here first and save time, for we have the gear or part.

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We Carry Gears for Almost All Late Model Cars

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New Schebler, Model R Carburetors 10.00 each
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Carload of Motors, bought from government, in fine shape 25.00 to 125.00 each
Complete Welding Outfits, Minus Tanks 65.00 each

Write for List

**MANY OTHER WONDERFUL BARGAINS
YOU ARE GUARANTEED SATISFACTION AND A SQUARE DEAL**

Auto Parts Co.

"The Largest Parts Company in the South"

HOUSTON, TEXAS

San Antonio House: 232 Nolan St.

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4-Cyl. Motors, new.....\$60.00
3 Speed Transmissions, new.....25.00
Demountable wheels with five rims, new, set.....20.00
Pressed steel frames.....5.00
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R.ies, upholstered, five passenger.....20.00
Front axles.....15.00
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WE CARRY A GREAT LINE OF SUPPLIES—LOOK AT THIS

200 Rayfield or Stromberg carburetors, new.....7.50
Battery boxes, 9x9x10......75
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Disco generators.....10.00
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8-cyl. (V8) motor, new.....200.00
6-cyl. Keystone motor, new.....125.00
17-in. steering wheels for Ford, new.....1.75
Ford cylinder block.....20.00
Flexible hot air tubing, per foot......12
Demountable rims, nearly all sizes.....1.50

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WANT IN THIS AD—WRITE US**

Auto Auction Co.

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**We Can Save You 50% to 75%
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for you. With this Bulletin in your shop you
can supply repair parts for all makes and
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SERVICE — Every inquiry will receive prompt attention. Orders shipped same day received. Satisfaction guaranteed or money refunded.

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Burg 40	Maxwell 2 & 4 cylinder; K-Q-25—Mitchell 40
J. I. Case 40	Moon 40
Chalmers 5A-L-R	Mason "May Tag" 4 cyl.
Chalmers F-K-L & Six 10-11M-18—Clark 40	Monarch 40—Moline
Cadillac 1909-1910	Monroe
Cameron—Crawford	Overland 30-32-35-38-41-42-52-56-59-69-71-75BR-79-81-83
Detroit—Enger 40	Oldsmobile 40
E. M. F. 30—Fal Car	Oakland 2 & 4 cyl. 30-40
Flanders 2 & 3 speed	Packard 1910—Premier
Firestone Columbia	Paige Detroit 25 H. P.
Fuller	Pullman 40
Ford—N. R. & S.	Reo 2 & 4 cyl. 4th & 5th
Great Northern	Rider Lewis—Sellers
Halladay—Haynes 1910	Rambler 34-40-44-53
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Complete Motors, Transmissions and Rear Axles, Money refunded on all parts within 10 days if unsatisfactory.

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We manufacture axles for all standard makes of cars. Our retail prices are 25% to 50% lower than factory prices.

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Order shipped same day received
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Stock of 5000 Springs
For All Makes of Popular Cars
New Springs 16c Per Lb.—Used 8c Per Lb.

Both new and used parts for all cars
We Have a Stock of 1000 Used Wheels
Cylinder Reboring and Fitting of Pistons
Given Prompt Attention

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with manufacturers and our prices
of every part

224 PAGES

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Parts for all makes of cars.

50% to 90% off M'fr's Lists

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New Firestone Q. D. 34x4 1/2, \$5.00; 36x4 1/2 \$5.50
34x4 Firestone S. S. Slightly Used..... 3.00
32x4 Firestone Q. D. Slightly Used..... 4.00
30x3 1/2 Stanweld Q. D. Slightly Used..... 2.00
36x4 1/2 Stanweld S. S. Slightly Used..... 3.00

All Rims and Rim Parts in Stock

KASTNER RIM COMPANY

2125 Michigan Avenue Chicago, Illinois

Memphis Auto Parts Co.

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"The Largest Parts House in the South"

Service — System — Satisfaction

Save 35 to 75%

We wreck hundreds of cars and are continually buying more. From our large assorted stock you will find the part you want.

Write for parts for the following cars.
Give model, number and part you want.

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American	Interstate	Rambler
Apperson	Krit	R. C. H.
Buick	Little	Regal
Cadillac	Lozier	Reo
Case	Marmon	Seldon
Chalmers	Maxwell	Speedwell
Cole	Michigan	Stearns
E. M. F. 30	Mitchell	Stevens-Duryea
Firestone	National	Stoddard-Dayton
Flanders	Oakland	Studebaker
Ford	Oldsmobile	Stutz
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Shipments made same day order is received. Remittance required on all orders to cover express charges. We guarantee our parts to be satisfactory or we will return your money.

—POPE HARTFORD PARTS—

Buy your parts for all models of Pope Hartford cars from the only legitimate and authorized manufacturers—who own the original drawings, patterns, tools and fixtures and are making these parts daily. Don't buy and use second hand parts. They may be the cause of serious accidents and result in much additional expense in the long run.

THE HARTFORD MOTOR CAR CO.
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Auto Salvage & Wrecking Co.

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ALWAYS TEARING 'EM UP—
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PARTS FOR
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Axles
'n Ever'thingALSO TIRE
BARGAINS
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50 TO 80%

OFF ON ORIGINAL PRICE ON
PARTS FOR ALL CARS

120 Magnets... \$ 5 to \$30	Coils\$2.50 to \$ 7
200 Radiators... 10 to 30	Carburetors ... 3 to 10
Rear Axles... 15 to 40	Springs 1 to 3.50
Front Axles... 5 to 10	Starters 12 to 15
Crank Shafts... 10 to 40	Generators ... 10 to 20
700 Roller Bearings 1 to 3.25	Diff. Gears... 5 to 10

PRESTO TANKS
 "B".....\$3.75 "E".....\$2.90 Searchlight...\$1.75
 25 MOTORS: Waukesha, \$60; Apperson 4, \$90 Stude-
 baker 6, 1914, Starter, Generator Magneto, \$100;
 Rutenber, 4 cyl., \$80; Regal N. Starter, Gen., \$70;
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 SEND DEPOSIT WITH ORDER—SATISFACTION
 OR MONEY BACK.

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We are especially equipped to meet your
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For All Cars

SPECIALS FOR FORDS
 Complete Roof and Back, Ready to Put On
 Roadster\$ 8.75
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 ONE MAN Touring Tops, complete..... 36.00

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GENERAL OR SPECIAL FORD CATALOG
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One Hundred 8-cylinder motors, 3 in. bore
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Very Complete Stock of Used Parts
WONDERFUL BARGAINS IN USED TIRESSave 50 to 75% on Parts
FOR MOST ANY MAKE OF CAR

Send trial order also old parts
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offers a large stock of used parts at bargain
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 that we mean, your money refunded if your
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This Week: Old Sol Lights, New...\$3.50

Orders shipped same day received
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 Special attention to magneto, generator & starter service
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CRAIG-HUNT Parts are the safest and BEST
COMPLETE SET, for lowering the Ford Frame

\$25.00

We make 16 valve Racing Heads, Racing Bodies,
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Pneumatic Tire Wheels for Ford Trucks.
 Five Detachable Wire Wheels for Fords.

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Brand New Parts

Including Transmission Gears,
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A GUARANTEE

with every part shipped. Complete
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 in full.

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ON OUR TIRESDemonstrating
All Non-Skid TIRES All Non-SkidThey Are MUCH BETTER
Than the Ordinary Used Tires

Size	Tire	Tube	Size	Tire	Tube
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30x3½.....	7.50	1.90	34x4½.....	13.50	2.60
31x3½.....	8.00	1.95	35x4½.....	14.00	2.65
32x3½.....	9.00	2.00	36x4½.....	15.00	2.75
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32x4.....	10.50	2.15	35x5.....	15.50	2.85
33x4.....	11.50	2.25	37x5.....	16.50	2.95
34x4.....	12.50	2.35	37x5½.....	18.00
32x4½.....	13.00	2.35	38x5½.....	25.00	....

5% Off for Cash in Full with Order. Other-
 wise, goods shipped C. O. D., subject to examina-
 tion. Specify whether clincher or straight side.

Royal Tire & Supply Co.
1461 Michigan Avenue CHICAGO, ILL.Samuel L. Winternitz & Company
AUCTIONEERS

Largest Liquidators of Motor Plants
 FIRST NAT. BANK BLDG. CHICAGO, ILL.

Just Write
Newton's Auto Salvage
 When you are in the market for
 Anything for the Automobile
 New and Used
 Gears—Axles—Bearings—etc.
FORD—
 Speedster Bodies\$ 65.00
 Cloverleaf Bodies 233.00
 Touring Bodies 260.00
 Write for particulars
 The Cut Rate
 Accessory Store
 205-11 10th St. Des Moines, Iowa

Tires

Tires

Tires

Our Customers Stay and Boost A Trial Order Will Show You Why

A Complete Stock of Slightly Used and Factory Repaired

T TIRES I TIRES R TIRES E TIRES S

A SATISFIED CUSTOMER IS OUR BIGGEST ASSET, THEREFORE
WE MUST SATISFY YOU

Size	Used Tire	New Tube	Size	Used Tire	New Tube	Size	Used Tire	New Tube
30x3	\$4.50	\$1.95	32x4	\$7.75	\$3.05	35x4 1/2	\$9.25	\$4.25
30x3 1/2	5.50	2.30	33x4	8.50	3.25	36x4 1/2	9.50	4.40
31x3 1/2	5.75	2.40	34x4	8.50	3.40	37x4 1/2	12.25	4.50
32x3 1/2	6.00	2.40	35x4	8.75	3.50	35x5	10.25	4.60
34x3 1/2	6.50	2.60	36x4	10.00	3.65	36x5	10.25	4.70
31x4	7.00	3.00	34x4 1/2	9.00	4.15	37x5	10.75	4.75

SPECIAL BARGAINS IN ODD SIZES

35x5 Clincher	\$ 8.00
42x4 1/2 Clincher	15.00

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly, with privilege of examination, and balance C. O. D. Specify style of rim to avoid delay.

Our Used Tires are not guaranteed for any definite number of miles, but we will make reasonable adjustments on all tires that do not give service in proportion to the price paid, providing tires are returned to us by prepaid express. Is not this fair enough?

WE CARRY A COMPLETE STOCK OF NEW TIRES
WRITE FOR PRICES, STATING SIZE DESIRED

LINCOLN TIRE & SUPPLY CO.

1463 South Michigan Avenue, Dept. I, CHICAGO, ILLINOIS

TIRES

JOB LOTS

Obsolete, Surplus Stocks and
Factory Seconds

WRITE—CALL

BROADWAY TIRE JOBBERS

250 West 54th Street

New York

Good Double Tread Tires, All Sizes Guaranteed 3000 Miles

30x3	\$ 5.25	32x4	\$ 8.75
30x3 1/2	6.25	33x4	9.00
32x3 1/2	7.50	34x4	9.50
31x4	8.25	35x4 1/2	11.50

Rebinder free with each tire. One dollar deposit with all C. O. D. orders.

REBUILT TIRE CO.

Kalamazoo, Mich.

T	USED TIRES	T
I	ALL KINDS OF TIRES	I
R	S. S. Clincher and Q. D. Tires, Plain or Non-Skid Tires, Cord Tires, Fabric Tires. New or Used Tires. All kinds—all makes.	R
E	GRAY'S AUTO GARAGE CO.	E
S	3212-3214 Brighton Road, N.E., Pittsburgh, Pa.	S
	TIRE SPECIALISTS	
	USED TIRES	

Good News!

This Substantial Reduction Is
Your Gain

Compare Our Prices
Then Order

QUALITY COUNTS

New Fresh Stock, Assorted Brands

Size	New Tires	Used Tires	New Tubes
28x3	\$ 7.80	\$ 5.00	\$1.75
30x3	7.80	6.00	1.75
30x3 1/2	9.80	6.00	2.10
32x3 1/2	11.55	7.50	2.20
34x3 1/2	13.45	8.00	2.55
31x4	15.15	8.50	2.70
32x4	15.40	8.50	2.75
33x4	16.10	9.00	2.85
34x4	16.50	10.00	2.90
35x4	18.75	10.00	3.30
36x4	19.30	10.50	3.40
33x4 1/2	21.45	10.50	3.45
34x4 1/2	22.20	11.00	3.55
35x4 1/2	23.20	11.00	3.65
36x4 1/2	23.55	11.50	3.75
37x4 1/2	26.95	11.50	4.30
35x5	29.10	12.50	4.40
36x5	29.90	13.00	4.85
37x5	30.75	13.50	4.55

Add 10% for Non-Skid Cases or Red Tubes. Special Prices to Dealers—Let Us Know Your Wants.

MAIL ORDERS SOLICITED

10% Deposit Required with Order, Balance C. O. D., Subject to Your Examination and Approval.

SERLIN TIRE CO.

Incorporated
1300-1302 Michigan Ave., Chicago, Ill.
PHONES: CALUMET 3407-3408

Big Reduction High Grade New

TIRES AND TUBES

Size	Tire	Tube
28 x 3	\$ 7.75	\$1.80
30 x 3	7.75	1.80
30 x 3 1/2	10.10	2.05
32 x 3 1/2	11.80	2.20
31 x 4	15.40	2.90
32 x 4	15.75	3.00
33 x 4	16.45	3.15
34 x 4	16.85	3.25
33 x 4 1/2	21.95	3.50
34 x 4 1/2	22.70	3.65
35 x 4 1/2	23.75	3.75
36 x 4 1/2	24.10	3.80
35 x 5	27.00	4.15
36 x 5	28.00	4.20
37 x 5	28.65	4.25

Add 10% for Non-Skid.

10% Deposit required with Order, Balance C.O.D., Subject to Examination.

The Armstrong Tire & Vulcanizing Co.

1342-44 Michigan Ave., Chicago, Ill.
Phone Calumet 5212 and 2199

SPECIAL OFFER

To Dealers On

NEW HIGH GRADE

T U B E S

DOZEN LOTS

Or More—All Sizes

\$1.35 Each.

Brand New

30x3 1/2 N.S. Casings

\$9.50 Each.

We Can Quote You Interesting Prices on

All Solid and Pneumatic Tires

ACORN TIRE & RUBBER CO.

1350-54 S. Michigan Ave., Chicago

Tires

Tires

Rebuilding and Repairing

TIRES AND TUBES

SLIGHTLY USED TIRES

OBTAINED FROM WRECKED CARS AND
FACTORY REPAIRED

Size	Tires	Tubes	35x4....	9.00	1.75
30x3....	\$ 4.50	\$1.35	34x4½..	9.00	1.75
30x3½..	5.50	1.45	35x4½..	9.25	1.80
32x3½..	6.00	1.50	36x4½..	9.50	1.85
31x4....	7.00	1.65	35x5....	10.25	2.00
32x4....	7.75	1.60	36x5....	10.25	2.00
33x4....	8.50	1.70	37x5....	10.75	2.20
34x4....	8.50	1.70			

\$1.00 Deposit Required With Each Tire Ordered, Balance
C. O. D., Subject to Examination. Specify Style of Rim.

AUTO NEEDS COMPANY

1602 Michigan Ave.
Chicago, Ill.MR. DEALER
U Need A Competitive Tire!

WHEN A CUSTOMER SAYS:
He can buy a tire cheaper around the
corner, that's the time for you to spring
this competitive tire on him.

"WILOXATLANTIC"
TIRES

Size	Nonskid	\$
30 x 3		7 01
30 x 3½		8 88
32 x 3½		10 38
31 x 4		13 87
32 x 4		14 11
33 x 4		14 82
34 x 4		15 13

These tires are "firsts" wrapped in paper,
bearing Serial Number and Mr.'s Name.
Order just one small size Tire for a
SAMPLE. After you see sample, you
will order a hundred or more.

Atlantic Tire & Rubber Co.
1305 Maryland Ave. Baltimore, Md.

Cord Type Tires
REBUILT
New Rubber

3-PLY RELINER

Vulcanized in Each Tire

30x3½	\$ 9.95
32x3½	11.50
31x4	14.50
32x4	14.95
33x4	15.95
34x4	16.50
34x4½	18.50
35x4½	18.95
36x4½	19.50

Deposit of \$1.00 on C. O. D. orders
State whether S. S. or Clincher

YALE DETROIT CYCLE CO.
502-504 Grand River, Detroit

Standard Used Tires

Best Values Ever Offered for the Money
SAVE YOURSELF 75%

By Buying Your Summer Needs Now

Size	Used Tire	New Tubes	Size	Used Tire	New Tubes
30x3....	\$ 4.50	\$1.75	34x4....	9.00	2.35
30x3½..	5.50	1.90	34x4½..	10.00	2.50
31x3½..	6.00	2.00	34x4½..	9.25	2.60
32x3½..	7.00	2.00	35x4½..	10.00	2.65
31x4....	7.00	2.15	36x4½..	10.00	2.75
32x4....	7.50	2.15	35x5....	10.50	2.85
33x4....	9.00	2.25	37x5....	11.50	2.95

\$1 deposit required with each tire ordered, balance
C. O. D., subject to examination. Specify clincher
or straight side.

5% Off for Cash in Full With Order

GOODWAY TIRE CO.

1463 MICHIGAN AVE. CHICAGO

REAL VALUES
HIGH GRADE NEW TUBES AND
TIRES

Some PRICES on NEW TIRES and Tubes

Size	Plain	Non-Skid	New Tubes
30x3	\$ 7.55	\$ 8.90	\$1.70
30x3½	9.75	10.85	2.10
32x3½	11.35	13.10	2.25
31x4	12.80	16.80	2.60
32x4	15.15	18.95	2.75
33x4	15.95	17.85	2.85
34x4	16.25	18.40	2.95

10% deposit required with order, balance
C. O. D., privilege examination.

Carl G. Wiesenmeyer
"The Tire King"
Springfield, Ill.

Special Bargains in
SLIGHTLY USED TIRES

The Kind That Will Satisfy All Customers

30x3....	\$4.50	32x4....	\$7.75	35x4½....	\$ 9.25
30x3½..	5.50	33x4....	8.50	36x4½....	9.50
31x3½..	5.75	34x4....	8.50	37x4½....	10.00
32x3½..	6.00	35x4....	8.75	35x5....	10.25
34x3½..	7.00	36x4....	8.75	36x5....	10.25
31x4....	7.00	34x4½..	9.00	37x5....	10.75

Send \$1.00 deposit with each tire ordered.
Balance C. O. D., subject to examination.
Specify if Clincher, Q. D., or Straight Side.

American Tire & Vulcanizing Co.
Phone: Calumet 5170
2136 S. MICHIGAN AVE., CHICAGO, ILL.

NEW REDUCED TIRE
PRICES

Size	Plain	Non-Skid
30x3	\$ 7.50	\$ 9.00
30x3½	9.50	11.50
32x3½	12.50	13.75
31x4	17.00	17.00
33x4	17.00	18.00
34x4	18.00	19.00

Dept. A.

10% Deposit required with each order.
Balance C. O. D.

VICTORIA TIRE & RUBBER CO.
1320 Michigan Avenue Chicago, Ill.

TIRES—SLIGHTLY USED

30x3½, \$5.00; 31x4 and 32x4, \$6.50 each; 33x4 and
34x4, \$7.00 each; 34x4½ and 35x4½, \$8.50 each; all
NONSKID. Standard make. 20 per cent deposit re-
quired on C. O. D. order. Big saving on all other
sizes and tubes also. State size and bead of tire.
Orders filled same day received.

M. LIBEN & CO.,

703M 7th Ave. New York City

PHONE
COLLINS 1533QUALITY
SERVICE

Trindl Machine Works

PISTONS—PISTON RINGS—WRIST PINS
CYLINDER GRINDING
SCORED CYLINDERS REPAIRED
CRANK SHAFT GRINDING

57-61 East 24th
Street
CHICAGOWrite for Our
Illustrated
BookletCYLINDER
GRINDINGNew Oversize Pistons, Rings and
Wrist Pins

Highest grade machinery and tool
equipment, no makeshift tools. This
equipment with our years of experi-
ence in the automotive business insures
you highest grade work at the hands
of experts. Work fully guaranteed.
Patterns for all pistons, 25,000 piston
rings and 5,000 wrist pins in stock. We
are the acknowledged leaders in our
line.

Aluminite Pistons and Connect-
ing Rods

put six cylinder smoothness into four
cylinder motors, give any motor more
power, more speed, quicker get away
and more miles per gallon with less
bearing trouble.

Power Plus Cylinder Head for
Ford Cars

keeps the motor cool, increases power
and speed.

Expert Motor Building and Over-
hauling

Motors refined and tuned for speed.
New and rebuilt motors in stock. Tell
us your motor problems. Our in-
creased equipment and space insures
prompt service and perfect work.

Ask Our Customers

Green Engineering
Company

Dayton,

Ohio

Cylinders
Reground

Over 800 Piston Patterns Al-
ways in Stock.

Our Expert Mechanics and our
Highest Grade Equipment are your
guarantee for highest class work-
manship.

Our Special Light Alloy Pistons
will give you More Power—More
Speed. We also do Gear Cutting of
Spur and Bevel Gears.

Write to Us Today

Auto Engine Works
St. Paul, Minn.

Rebuilding and Repairing

Rebuilding and Repairing

Send Your Scored Cylinders to Lawrence

There is a branch near you as noted in this advertisement. The Lawrence patented process eliminated reboring, therefore will save your customer the expense of buying new pistons and rings. In this process, we fuse silver nickel alloy then grind it flush with cylinder wall.

Cracked Water Jackets

are repaired by this process without pre-heating—insures against warping. We run a 24-hour service at our factory giving you the quickest kind of action. Write to the branch nearest you for full information. There is big money and satisfaction in this work for you.

L. LAWRENCE & COMPANY

CHICAGO.....1522 Michigan Ave.
NEW YORK CITY.....791-793 11th Ave.
CLEVELAND.....1810 Prospect
NEWARK, N. J.....292 Halsey Street
DETROIT.....1246 East Jefferson

SAN FRANCISCO.....116 Hyde St.
PHILADELPHIA.....1601 Summer Ave.
LOS ANGELES.....335 Washington St.
MILWAUKEE.....18 to 24 Martin St.
MEMPHIS, TENN.....247 Poplar St.

GUARANTEED

Cylinder Regrinding

PISTONS—RINGS—PINS

When you send us your cylinders to be reground, and fitted with new pistons and rings, you know they will be returned to you correct to a third of a thousandth of an inch, because—

Our guarantee specifies that if, for any reason whatever you are not satisfied, you may return the new pistons and be refunded your money without quibble. Like the guarantee? That's our policy. Send your work.

NEUPERT MFG. CO.

82 Lark Street

Buffalo, N. Y.

SCORED CYLINDERS

We guarantee to repair any cylinder that has been scored by loose piston pin with out heating or grinding. Use same pistons. A mechanical process patented 1917. Has given satisfaction for past three years.

TERRITORY WITH MACHINE SOLD TO LIVE REPAIRMEN
Write for Descriptive Literature.
A Profitable Business

EAGLE MACHINE COMPANY

INDIANAPOLIS, IND.

SEND
YOUR

CYLINDER GRINDING TO KANSAS CITY

We have a fine plant, equipped with the most modern facilities for cylinder grinding and fitting of pistons and wrist pins. Our workmen are experts. All jobs inspected before shipping.

QUICK SERVICE AND ATTRACTIVE PRICES TO GARAGE AND REPAIR MEN

1505 McGee Street

HARRY LEE MACHINE WORKS

Kansas City, Mo.

Rebuilding and Repairing

CYLINDER and CRANKSHAFT GRINDING

Oversize Piston, Rings and Wrist Pins made to fit. Skilled mechanics and Special Accurate Machinery. Write for our booklet for prices and useful information.

MODERN AUTO REPAIR & RECONSTRUCTION CO.
4661-3-5-7-9-11 Olive St., St. Louis, Mo.

WE WILL GIVE YOUR Motor More Power

If you let us Regrind the Cylinders, fit New Pistons and Rings we will guarantee that your engine will have more power, that you will have no more carbon troubles and that you will use less gas and oil. We do only high grade work and fully guarantee it.

Special Prices to Repair Men

Bridgeport Piston Ring Co.

Third St. & Conn. Av., Bridgeport, Conn.

Attention

CAR OWNERS

Winter driving demands strong engines. Why not give that trouble a knockout punch by having the

Cylinders Reground

AND EQUIPPED WITH NEW
PISTONS, PINS and RINGS

by the
BUTLER MFG. CO.
INDIANAPOLIS, IND.

CYLINDER GRINDING

Complete job for
FORDS—\$17 PER CAR

Cylinders reground, new pistons ground and fitted, also new rings, bushings and wrist pins. Cylinders for other cars, trucks, tractors, and motor boats reground at moderate cost on B. & S. and Heald grinders. Pistons turned and fitted. Our work is guaranteed to be correct within one-third of a thousandth.

FROSTHOLM BROS.

1809 Park Street

Syracuse, N. Y.

ARE YOU SUCCESSFUL? Successful cylinder grinding companies are built on the HEALD NO. 60 Cylinder Grinding Machine. Let us furnish you further information.

THE HEALD MACHINE CO.

Worcester, Mass.

THE LARGEST PLANT IN THE U. S.

AND THE BEST EQUIPPED—SPECIALIZING ON crank shaft regrinding, cylinder regrinding and repairing of scored cylinders, is at your service. We do not file and lap crank shafts but grind them on special machines. We have a battery of machines for cylinder regrinding and use the famous Eagle process for scored cylinders. We also shrink starter steel ring gears on fly-wheels.
NO WAITING FOR WEEKS—QUICK SERVICE—ABSOLUTE SATISFACTION
A TRIAL IS MOST CONVINCING—SHOOT 'EM IN

STAFFORD MOTOR CAR COMPANY

KANSAS CITY, MO.

When Writing to Advertisers, Please Mention Motor Age

Rebuilding and Repairing

Steel Gear Rings

For Self-Starters

For replacements or new installations
Silent Chain SprocketsFor
Generator & Magneto Drives

Our Prices Will Interest You

The Adapt Machinery Company
1624-1632 S. Wabash Ave. Chicago, Ill.**Cylinders Reground**Scored or cracked cylinders
welded. Oversize Pistons
and Rings furnished.**Emerson Manufacturing Co.**
1075 Gratiot Ave. Detroit, Michigan**CYLINDER REBORING**FOR PASSENGER CARS—TRUCKS—TRACTORS
We have the capacity and the skilled workmen.
Satisfaction guaranteed. "ONCE A CUSTOMER—
ALWAYS A CUSTOMER" is our motto. We are also
specialists in high grade PISTONS, RINGS and PINS.
Special attention given to Trucks and Tractors.**PARK MACHINE CO.**
22 West 3rd Street ST. PAUL, MINN.**CYLINDERS REGROUND**including new pistons and rings. Any size up
to 5-inch bore—\$5 to \$10 per cylinder. All our
work guaranteed. Quick shipments. Let us
prove our ability on your next job.**NEUPERT MFG. COMPANY**
82 Lark Street Buffalo, N. Y.**CYLINDERS REGROUND**Best equipment and expert mechanics mean
high class work—our kind. Special attention
given to tractor work. Yes—we duplicate
parts and do welding. Prompt service.**MCDONALD AUTO PARTS**
St. Marys, Ohio**STEEL RING GEARS**for starter fly wheels. You can install the gear your-
self. We show you how—or send 'em in.**CYLINDER GRINDING**Quick service and expert work.
WRITE TODAY**CRAGO MACHINE WORKS**
1416 Walnut St. Kansas City, Mo.**CYLINDERS**

REBORED or REGROUND

FITTED WITH NEW PISTONS AND RINGS
Satisfaction Guaranteed.**HOPE MACHINE CO.**
2312 North 2nd Street. Philadelphia, Pa.**All Parts Duplicated**Cylinders Reground. General Machine Work for
Foreign and American Cars. Welding of All Metals.
Manufacturers of **CATELAIN ROSE COUPLING**.
Ever-Ready Starters. U. S. Shock Eliminators.
QUICK SERVICE; SATISFACTION GUARANTEED**ANDRE CATELAIN**
1446-8 Indiana Ave. CHICAGO, ILL.Rebuilding and Repairing
Magnetos and Service Stations**CYLINDER GRINDING**Manufacturing of oversize Pistons, and
Wrist Pins, for all makes of Cars, Trucks
and Tractors. All work guaranteed. Best
workmanship.

Send for Our Price List

MILWAUKEE CYLINDER GRINDING CO.
Humboldt & Concordia Ave., Milwaukee, Wis.**Cylinder Reboring**

Welding and General Machine Work

We are especially equipped
to handle the above lines
and guarantee satisfaction.
Prompt Service Expert Workmanship**OLSON & DETLIE CO.**
219-25 W. 7th St. Sioux Falls, S. D.**Expert Cylinder Grinding**Oversize and standard pistons, rings and
wrist pins. We use our famous Double Lap
Joint piston rings. Scored and cracked cyl-
inders repaired. Work guaranteed.**WOODRUFF ENGINEERING CO.**
5315 Euclid Avenue Cleveland, OhioWe special-
ize on the **REBORING**
of cylinders and the**WELDING**of parts—both light and heavy. No job too
small! None too large! Quick service and
good service. WRITE US NOW.**BRUNKER MACHINE SHOP**
232 South Water St. WICHITA, KANSAS**CYLINDERS
REGROUND**Piston Rings and Wrist Pins Fitted. Ma-
chine work of all descriptions.**DELCO IGNITION SPECIALISTS****WM. BENDER**
1829 Indiana Avenue Chicago, Ill.**WELDING
OF ALL METALS**

Scored Cylinders Repaired

CYLINDERS REGROUND—PISTONS FITTED

Ask about our guarantee.

A. PONDELICK, 226 S. Winchester Ave., Chicago**Cylinders Reground**

Pistons, Rings, Wrist Pins, Fitted

Gear Cutting of All Kinds

Magneto Parts and Repairing

Official Sims-Huff Service Station

E. H. ODOM BROTHERS COMPANY
19 James St. ATLANTA, GA.**EXPERT REBORING**of Cylinders and Welding of Broken Parts constitutes
our main business. Our badly scored cylinders we
use old pistons by putting sleeve in cylinder. We
maintain one of the largest and best equipped plants
in the West for this work. Try us for real satisfaction.**STANDARD WELDING & MACHINE CO.**
416-418 East Second St. Des Moines, Iowa**WE GRIND**Cylinders and fit special heat-treated Pistons.
Welding of all kinds of Metals. Gear Cutting
of all kinds. Scored Cylinders Repaired and
Guaranteed for the Life of the Motor.**PONDELICK BROS.**Largest Mfrs. of Duplicate Auto Parts in U. S.
Leavitt St. & Jackson Blvd. Chicago, Ill.**SEND IT TO DETROIT****ELECTRICAL EQUIPMENT**

Genuine Parts—Superior Service.

AUTO ELECTRIC & SERVICE CORP.
11-19 SELDEN AVE.

Magnetos and Service Stations

**Starting, Lighting and
Ignition Experts**THE PELLET MAG-
NETO COMPANY with its
highly trained organization
and its irreproachable Sales,
Service and Stock Depart-
ment places at your disposal**"THE SERVICE WITH THE SPARK"**
Send for our 224-page catalog just
issued—it contains valuable information.**Pellet Magneto Company**
25th and Wabash Avenue Chicago, Illinois**FOR SALE-ELECTRIC MOTORS**

Single Phase 60 Cycle Motors

1-1/2 H. P. Gen. Electric 1750 R.P.M.
1-1 H. P. Gen. Electric 1750 R.P.M.
1-2 H. P. Wagner 1750 R.P.M.
1-3 H. P. Century 1750 R.P.M.
Second Hand Electric Motors Bought, Sold and Ex-
changed**GREGORY ELECTRIC CO.**
16th & Lincoln Sts. Chicago, Ill.**ATTENTION**

GARAGE and REPAIRMENT!

Equip your repair shop with

THE ONAN TESTING DEVICE

a test rack

to drive and test all kinds of generators, magnetos and

starters. Inquiries solicited. Manufactured by

DAVID W. ONAN

1324 Penn Ave. N. Minneapolis, Minn.

Magnetos

REPAIRED

ERIC J. GUSTAFSON413-415-417 So. Winnebago St.
ROCKFORD, ILL.**MAGNETOS — BATTERIES — GENERATORS**

Repaired—Rebuilt—Re-Newed

Send for Dealers' and Garagemen's Price Sheet
for Magneto, Generator, Battery, Tire and Radiator
repairing and rebuilding; cylinder reboring and weld-
ing work.

We Are Experts and Have Big Facilities

KANSAS AUTO SERVICE CO.
121 N. Topeka Ave. Wichita, Kansas**Bluff City Electrical Co.**
MEMPHIS, TENN.Official representative for Bijur, Westing-
house, Eisemann, Ericsson Mfg. Co., etc.**EXPERT REPAIR SERVICE on Mag-
netos, Starters and Ignition****New STORAGE BATTERIES**

Wholesale Factory Prices Guaranteed 18 Months

6 Volt, \$19.50 For 12 Volt, \$28.505% off for cash in full with order, or \$2.00 deposit
required with each battery ordered. Balance C. O. D.
subject to examination. State model and year of car.**GUARANTEE STORAGE BATTERY CO.**
55 East 18th Street Chicago, Ill.**MAGNETOS — COILS
GENERATORS and DISTRIBUTORS**

EVERY MAKE IN STOCK

Expert Repairing Quick Service

Write today for our Catalog

MEINERT MAGNETO SPECIALTY CO.
1216 Prospect Avenue Cleveland, Ohio**MAGNETOS REPAIRED**

PROMPT AND EFFICIENT SERVICE

Heinze Starters and Magneto Parts in Stock
SEND THAT MAGNETO IN TODAY FOR REPAIRS**CARL A. ANDERSON**

Dept. M, 1407 Jackson St., OMAHA, NEB.

Magnetos and Service Stations
Radiator and Lamp Repairing

Magnetos and Service Stations
Radiators and Lamp Repairing

Radiators and Lamp Repairing
Miscellaneous

Anything Electrical Repaired

ON YOUR AUTO

"At Prices You Will Be Glad to Pay"

"QUICKER SERVICE"

DETROIT MAGNETO EXCHANGE

188 Grand River Avenue

DETROIT, MICH.

ELECTRIC SPECIALISTS

Starters, Generators, Magnetos, Coils, Cutouts and Armature rewinding. Parts and Units in stock. 24-hour service. Chicago Distributors for Prest-O-Lite Batteries, Gas Tanks and Appliances. Dept A

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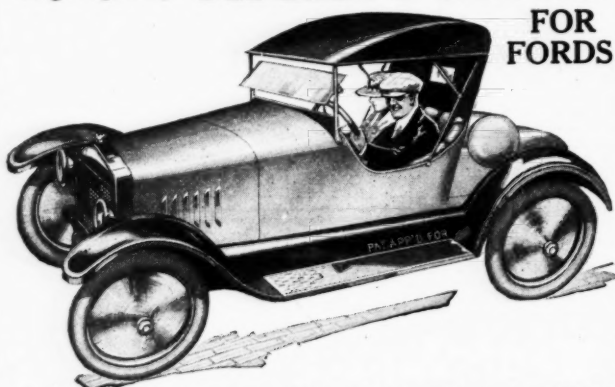
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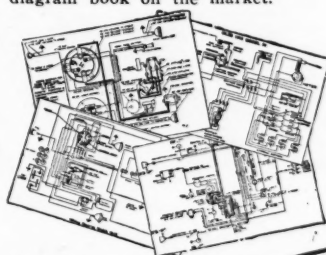
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850 WIRING DIAGRAMS

In New Edition of AUTO ELECTRICIANS GUIDE

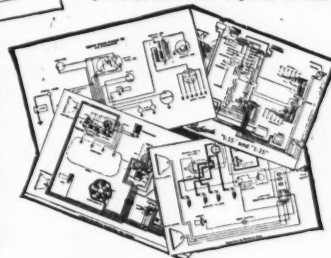
Contains wiring diagrams for every car on the market including the new 1919 Starting and Lighting Systems for Ford cars, also diagrams for Baker R. & L. and Detroit Electric and pipe connections for Stanley Steamers. Covers all kinds of systems from 1912 to 1919 and many as far back as 1906. Most complete diagram book on the market.



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HARTFORD CONNECTICUT

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put on

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QUALITY
The Replacement Spring

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Sumter, S. C.



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CARBURETOR

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WHY it was used on the effective French Renault tanks.

WHY it is used by a majority of European automobile manufacturers, including Delage, Peugeot, Gregoire, DeDion and many other well known makers.

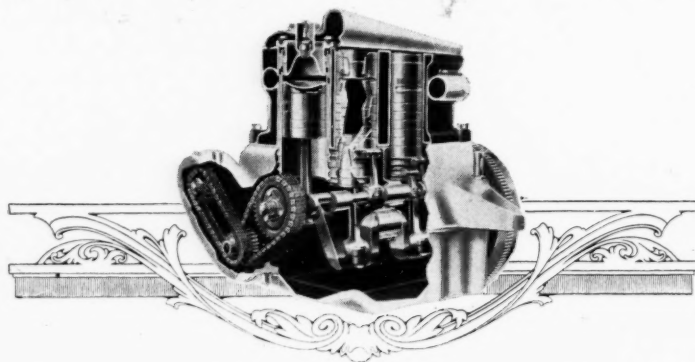
WHY it is used by over one hundred manufacturers of passenger and commercial cars in the U. S. A.

WHY YOU should use ZENITH EQUIPMENT.

ZENITH CARBURETOR COMPANY
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Every Willys-Knight owner tells in his own way the satisfaction he gets from this silent, economical motor. All agree in calling it the "Motor that always runs."

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KNIGHT
Sleeve-Valve Motor

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f. o. b. Toledo

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